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## SOLUBILITY DATA SERIES

Volume 1

HELIUM AND NEON - Gas Solubilities

## SOLUBILITY DATA SERIES

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# SOLUBILITY DATA SERIES

Volume 1

# HELIUM AND NEON — Gas Solubilities

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Foreword

If the knowledge is undigested or simply wrong, more is not better

How to communicate and disseminate numerical data effectively in chemical science and technology has been a problem of serious and growing concern to IUPAC, the International Union of Pure and Applied Chemistry, for the last two decades. The steadily expanding volume of numerical scientific and technological information, the formation of new interdisciplinary areas in which chemistry is a partner, and the links between these and existing traditional subdisciplines in chemistry, along with an increasing number of users, have been considered as urgent aspects of the information problem in general, and of the numerical data problem in particular.

Among the several numerical data projects initiated and operated by various IUPAC commissions, the *Solubility Data Project* is probably one of the most ambitious ones. It is concerned with preparing a comprehensive critical compilation of data on solubilities in all physical systems, of gases, liquids and solids. Both the basic and applied branches of almost all scientific disciplines require a knowledge of solubilities as a function of solvent, temperature and pressure. Solubility data are basic to the fundamental understanding of processes relevant to agronomy, biology, chemistry, geology and oceanography, medicine and pharmacology, and metallurgy and materials science. Knowledge of solubility is very frequently of great importance to such diverse practical applications as drug dosage and drug solubility in biological fluids, anesthesiology, corrosion by dissolution of metals, properties of glasses, ceramics, concretes and coatings, phase relations in the formation of minerals and alloys, the deposits of minerals and radioactive fission products from ocean waters, the composition of ground waters, and the requirements of oxygen and other gases in life support systems.

The widespread relevance of solubility data to many branches and disciplines of science, medicine, technology and engineering, and the difficulty of recovering solubility data from the literature, lead to the proliferation of published data in an ever increasing number of scientific and technical primary sources. The sheer volume of data has overcome the capacity of the classical secondary and tertiary services to respond effectively.

While the proportion of secondary services - of the review article type - is generally increasing due to the rapid growth of all forms of primary literature, the review articles become more limited in scope and more specialized. The disturbing phenomenon is that in some disciplines, certainly in chemistry, authors are reluctant to treat even those limited-inscope reviews exhaustively. There is a trend to preselect the literature, sometimes under the pretext of reducing it to manageable size. The crucial problem with such preselection - as far as numerical data are concerned is that there is no indication as to whether the material excluded was done by design or by less than thorough literature search. We are equally concerned that most current secondary sources, critical in character as they may be, give scant attention to numerical data.

On the other hand, tertiary sources - handbooks, reference books, and other tabulated and graphical compilations - as they exist today, are comprehensive but, as a rule, uncritical. They usually attempt to cover whole disciplines, thus obviously are superficial in treatment. Since they command a wide market, we believe that their service to advancement of science is at least questionable. Additionally, the change which is taking place in the generation of new and diversified numerical data, and the rate by which this is done, is not reflected in an increased third-level service. The emergence of new tertiary literature sources does not parallel the shift that has occurred in the primary literature.

The status of current secondary and tertiary services being as they are briefly stated above, the innovative approach of the Solubility Data Project is that its compilation and critical evaluation work involve consolidation and reprocessing services when both activities are based on intellectual and scholarly reworking of information from primary sources. It comprises compact compilation, rationalization and simplification, and the fitting of isolated numerical data into a critically evaluated general framework.

The Solubility Data Project developed a mechanism which involves a number of innovations in exploiting the literature fully, and which contains new elements of a more imaginative approach of transfer of reliable information from primary to secondary/tertiary sources. The fundamental trend of the Solubility Data Project is toward integration of secondary and tertiary services with the objective of producing in-depth critical analysis and evaluation which are characteristic to secondary services, in a scope as broad as conventional tertiary services.

Fundamental to the philosophy of the project is the recognition that the basic element of strength is the active participation of career scientists in it. Consolidating primary literature data and producing a truly critically-evaluated set of numerical data, and synthesizing data in a meaningful relationship, are demands considered worthy of the efforts of top scientists. Career scientists, who themselves contribute to science by their involvement, in active scientific research, are the backbone of the project. The scholarly work is commissioned to recognized authorities, involving a process of careful selection in the best tradition of IUPAC. This selection in turn is the key to the quality of the output. These top experts are expected to view their specific topics dispassionately, paying equal attention to their own contributions and to those of their peers. They digest literature data into a coherent story by weeding out what is wrong from what is believed to be right. To fulfill this task, the evaluator must cover  $a\ell\ell$  relevant open literature. No reference is excluded by design and every effort is made to detect every bit of relevant primary source. Poor quality or wrong data are mentioned and explicitly disqualified as such. In fact, it is only when the reliable data are presented alongside the unreliable data that proper justice can be done. The user is bound to have incomparably more confidence in a succinct evaluative commentary and a comprehensive review with a complete bibliography to both good and poor data.

It is the standard practice that any given solute-solvent system consists of two essential parts: I. Critical Evaluation and Recommended Values, and II. Compiled Data Sheets.

The Critical Evaluation part gives the following information: (i) a verbal text of evaluation which discusses the numerical solubility information appearing in the primary sources located in the literature. The evaluation text concerns primarily the quality of data after consideration of the purity of the materials and their characterization, the experimental method employed and the uncertainties in control of physical parameters, the reproducibility of the data, the agreement of the worker's results on accepted test systems with standard values, and finally, the data fit to generally accepted graphical tests;

(ii) a set of recommended numerical data. Whenever possible, the set of recommended data includes weighted average and standard minimum deviations, and a set of smoothing equations derived from the experimental data endorsed by the evaluator;

(iii) a graphical plot of recommended data.

The compilation part consists of data sheets of the best experimental data in the primary literature. Generally speaking, such independent data sheets are given only to the best and endorsed data covering the known range of experimental parameters. Data sheets based on primary sources where the data are of a lower precision are given only when no better data are available. Experimental data with a precision poorer than considered acceptable are reproduced in the form of data sheets when they are the only known data for a particular system. Such data are considered to be still suitable for some applications, and their presence in the compilation should alert researchers to areas that need more work.

The typical data sheet carries the following information:

(i) components - definition of the system - their names, formulas and Chemical Abstracts registry numbers;

(ii) reference to the primary source where the numerical information is reported. In cases when the primary source is a less common periodical or a report document, published though of limited availability, abstract references are also given;

(iii) experimental variables;

(iv) identification of the compiler, his affiliation and the date of compilation; (v) experimental values as they appear in the primary source. When-

(v) experimental values as they appear in the primary source. Whenever available, the data are given both in tabular and graphical form. If auxiliary information is available, the experimental data are converted also to SI units by the compiler.

Under the general heading of Auxiliary Information, the essential experimental details are summarized:

(vi) experimental method used for the generation of data;

(vii) type of apparatus and procedure employed;

(viii) source and purity of materials;

(ix) estimated error;

(x) references relevant to the generation of experimental data as cited in the primary source.

This new approach to numerical data presentation, developed during our four years of existence, has been strongly influenced by the diversity of background of those whom we are supposed to serve. We thus deemed it right to preface the evaluation/compilation sheets in each volume with a detailed discussion of the principles of the accurate determination of relevant solubility data and related thermodynamic information.

Finally, the role of education is more than corollary to the efforts we are seeking. The scientific standards advocated here are necessary to strengthen science and technology, and should be regarded as a major effort in the training and formation of the next generation of scientists and engineers. Specifically, we believe that there is going to be an impact of our project on scientific-communication practices. The quality of consolidation adopted by this program offers down-to-earth guidelines, concrete examples which are bound to make primary publication services more respon-sive than ever before to the needs of users. The self-regulatory message to scientists of 15 years ago to refrain from unnecessary publication has not achieved much. The literature is still, in 1978, cluttered with poor-quality articles. The Weinberg report (in "Reader in Science Information," Eds. J. Sherrod and A. Hodina, Microcard Editions Books, Indian Head Inc., 1973, p. 292) states that "admonition to authors to restrain themselves from premature, unnecessary publication can have little effect unless the climate of the entire technical and scholarly community encourages restraint... We think that projects of this kind translate the climate into operational terms by exerting pressure on authors to avoid submitting low-grade mater-ial. The type of our output, we hope, will encourage attention to quality as authors will increasingly realize that their work will not be suited for permanent retrievability unless it meets the standards adopted in this project. It should help to dispel confusion in the minds of many authors of what represents a permanently useful bit of information of an archival value, and what does not.

If we succeed in that aim, even partially, we have then done our share in protecting the scientific community from unwanted and irrelevant, wrong numerical information.

A. S. Kertes

July 1978

#### Editor's Preface

The users of this volume will find (1) the best available experimental solubility data of helium and neon gas in liquids as reported in the scientific literature, (2) tables of smoothed mole fraction solubility data for the systems which were studied over a temperature interval and (3) tables of either tentative or recommended solubility data when two or more laboratories reported solubility data over the same range of temperature and pressure. Users have the option of using the experimental values either directly or in their own smoothing equations or of using the smoothed values ture thoroughly enough so that the user need not do a detailed literature search for helium and neon solubility data prior to 1978.

Some words of explanation are required with respect to units, corrections, smoothing equations, auxiliary data and data sources, nomenclature and other points. The experimental data are presented in the units found in the original paper. In addition the original data are often converted to other units, especially mole fraction. Temperatures have been converted to Kelvin. In evaluations of solubility data, S.I. units are used.

Only in the past 10 to 15 years have experimental methods for the determination of the solubility of gases in liquids developed to the point where 0.5 percent or better accuracy is attained. Only a small fraction of the literatures' gas solubility data are accurate to 0.5 percent. The corrections for non-ideal gas behavior and for expansion of the liquid phase on dissolution of the gas are small and well within the normal experimental error. Thus such corrections were not made for the helium and neon gas solubility data at low pressure.

The lack of high accuracy is also the reason that, excepting water as a solvent, only a two-constant equation is used to smooth and evaluate the gas solubility data. A Gibbs energy of solution equation linear in temperature is used

 $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = A + BT$ 

or in alternate form

 $\ln X_1 = -\Delta G^o / RT = -(A/R) / T - (B/R)$ 

where A is  $\Delta H^{\circ}$ , B is  $-\Delta S^{\circ}$ , X<sub>1</sub> is the mole fraction solubility at a gas partial pressure of 101.325 kPa (1 atm), and R is 8.31433 J K<sup>-1</sup> mol<sup>-1</sup>.

An inconsistency, which we believe is justified, is found with respect to the solubility data in water. Much time and effort was expended in evaluating the solubility data of each gas in water. A recommended equation and table of values are presented. However, for systems which contain water and other solvent components such as electrolytes or water miscible polar organic compounds, the experimental gas solubility in water from that paper is given, even when it is at variance with our recommended values. These data of sometimes poorer quality are presented because the author's ratio of gas solubility in water to solubility in the aqueous solution may be more accurate than the solubility itself. This may be especially true of some of the solubility data in aqueous electrolyte solutions.

Solvent density data were often required in making solubility unit conversions. The density data were not directly referenced. The main sources of density data are

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American Petroleum Research Project 44 Publications The International Critical Tables, Volume III (E.W. Washburn, Editor) McGraw-Hill Co., 1931

McGraw-Hill Co., 1931
Smow Table, <u>Pure and Applied Chemistry</u> 1976, 45, 1-9
Thermodynamic Properties of Aliphatic Alcohols, R. C. Wilhoit and B. J. Zwolinski, J. Phys. Chem. <u>Ref. Data</u> 1973, 2, Supplement No. 1
Organic Solvents, J. A. Riddick and W. B. Bunger (Technique of Chemistry, Volume II, A. Weissberger, Editor) Wiley-Interscience, New York, 1970, 3rd Ed. The Ostwald Coefficient, L

The Ostwald coefficient, L, is defined as the ratio of the volume of gas absorbed to the volume of the absorbing liquid, all measured at the same temperature:

$$L = \frac{V(q)}{V(1)}$$

If the gas is ideal and Henry's Law is applicable, the Ostwald coefficient is independent of the partial pressure of the gas. It is necessary, in practice, to state the temperature and total pressure for which the Ostwald coefficient is measured. The mole fraction solubility, X, is related to the Ostwald coefficient by

$$X = \left[ \frac{RT}{P(g) L v^{O}(1)} + 1 \right]^{-1}$$

where P is the partial pressure of gas. The mole fraction solubility will be at a partial pressure of P(g).

The Absorption Coefficient, B

There are several "absorption coefficients", the most commonly used one being defined as the volume of gas, reduced to 273.15K and 1 atmosphere, absorbed per unit volume of liquid when the total pressure is 1 atmosphere.  $\beta$  is related to the Bunsen coefficient by

 $\beta = \alpha (1-P(1))$ 

where P(1) is the partial pressure of the liquid in atmosphere.

The Henry's Law Constant

A generally used formulation of Henry's Law may be expressed as

 $P(g) = K_H X$ 

where  ${\rm K}_{\rm H}$  is the Henry's Law constant and X the mole fraction solubility. Other formulations are

 $P(g) = K_2C(1)$ 

or

 $C(g) = K_{c}C(1)$ 

where  $K_2$  and  $K_C$  are constants, C the concentration, and (1) and (g) refer to the liquid and gas phases. Unfortunately,  $K_H$ ,  $K_2$  and  $K_C$  are all sometimes referred to as Henry's Law constants. Henry's Law is a limiting law but can sometimes be used for converting solubility data from the experimental pressure to a partial gas pressure of 1 atmosphere, provided the mole fraction of the gas in the liquid is small, and that the difference in pressures is small. Great caution must be exercised in using Henry's Law.

The Mole Ratio, N

The mole ratio, N, is defined by

N = n(g)/n(1)

Table 1 contains a presentation of the most commonly used inter-conversions not already discussed.

For gas solubilities greater than about 0.01 mole fraction at a partial pressure of 1 atmosphere there are several additional factors which must be taken into account to unambiguously report gas solubilities. Solution densities or the partial molar volume of gases must be known. Corrections should be made for the possible non-ideality of the gas or the non-applicability of Henry's Law.

The solubility data are supplemented with partial molal volume and calorimetric enthalpy of solution data when they are available.

Chemical Abstracts recommended names and registry numbers were used throughout. Common names are cross referenced to Chemical Abstract recommended names in the index.

The Editor would appreciate users calling errors and omissions to his attention.

The Editor gratefully acknowledges the advice and comments of members of the IUPAC Commission on Equilibrium Data and the Subcommittee on Solubility Data; the cooperation and hard work of the Evaluators and compilers; and the untiring efforts of the typists Peggy Tyler, Carolyn Dowie, and Lesley Flanagan.

Acknowledgment is made to the Donors of the Petroleum Research Fund, administered by the American Chemical Society, for partial support of the compilation and evaluation of the gas solubility data.

H. Lawrence Clever

July 1978

#### THE SOLUBILITY OF GASES IN LIQUIDS

C. L. Young, R. Battino, and H. L. Clever

#### INTRODUCTION

The Solubility Data Project aims to make a comprehensive search of the literature for data on the solubility of gases, liquids and solids in liquids. Data of suitable accuracy are compiled into data sheets set out in a uniform format. The data for each system are evaluated and where data of sufficient accuracy are available values recommended and in some cases a smoothing equation suggested to represent the variation of solubility with pressure and/or temperature. A text giving an evaluation and recommended values and the compiled data sheets are published on consecutive pages.

#### DEFINITION OF GAS SOLUBILITY

The distinction between vapor-liquid equilibria and the solubility of gases in liquids is arbitrary. It is generally accepted that the equilibrium set up at 300K between a typical gas such as argon and a liquid such as water is gas-liquid solubility whereas the equilibrium set up between hexane and cyclohexane at 350K is an example of vapor-liquid equilibrium. However, the distinction between gas-liquid solubility and vapor-liquid equilibrium is often not so clear. The equilibria set up between methane and propane above the critical temperature of methane and below the critical temperature of propane may be classed as vapor-liquid equilibrium or as gas-liquid solubility depending on the particular range of pressure considered and the particular worker concerned.

The difficulty partly stems from our inability to rigorously distinguish between a gas, a vapor, and a liquid which has been discussed in numerous textbooks. We have taken a fairly liberal view in these volumes and have included systems which may be regarded, by some workers, as vapor-liquid equilibria.

#### UNITS AND QUANTITIES

The solubility of gases in liquids is of interest to a wide range of scientific and technological disciplines and not solely to chemistry. Therefore a variety of ways for reporting gas solubility have been used in the primary literature and inevitably sometimes, because of insufficient available information, it has been necessary to use several quantities in the compiled tables. Where possible, the gas solubility has been quoted as a mole fraction of the gaseous component in the liquid phase. The units of pressure used are bar, pascal, millimeters of mercury and atmosphere. Temperatures are reported in Kelvin.

#### EVALUATION AND COMPILATION

The solubility of comparatively few systems is known with sufficient accuracy to enable a set of recommended values to be presented. This is true both of the measurement near atmospheric pressure and at high pressures. Although a considerable number of systems have been studied by at least two workers, the range of pressures and/or temperatures is often sufficiently different to make meaningful comparison impossible.

Occasionally, it is not clear why two groups of workers obtained very different sets of results at the same temperature and pressure, although both sets of results were obtained by reliable methods and are internally consistent. In such cases, sometimes an incorrect assessment has been given. There are several examples where two or more sets of data have been classified as tentative although the sets are mutually inconsistent.

Many high pressure solubility data have been published in a smoothed form. Such data are particularly difficult to evaluate, and unless specifically discussed by the authors, the estimated error on such values can only be regarded as an "informed guess". Many of the high pressure solubility data have been obtained in a more general study of high pressure vapor-liquid equilibrium. In such cases a note is included to indicate that additional vapor-liquid equilibrium data are given in the source. Since the evaluation is for the compiled data, it is possible that the solubility data are given a classification which is better than that which would be given for the complete vapor-liquid data (or vice versa). For example, it is difficult to determine coexisting liquid and vapor compositions near the critical point of a mixture using some widely used experimental techniques which yield accurate high pressure solubility data. For example, conventional methods of analysis may give results with an expected error which would be regarded as sufficiently small for vapor-liquid equilibrium data but an order of magnitude too large for acceptable high pressure gas-liquid solubility.

It is occasionally possible to evaluate data on mixtures of a given substance with a member of a homologous series by considering all the available data for the given substance with other members of the homologous series. In this study the use of such a technique has been very limited.

The estimated error is often omitted in the original article and sometimes the errors quoted do not cover all the variables. In order to increase the usefulness of the compiled tables estimated errors have been included even when absent from the original article. If the error on *any* variable has been inserted by the compiler this has been noted.

#### PURITY OF MATERIALS

The purity of materials has been quoted in the compiled tables where given in the original publication. The solubility is usually more sensitive to impurities in the gaseous component than to liquid impurities in the liquid component. However, the most important impurities are traces of a gas dissolved in the liquid. Inadequate degassing of the absorbing liquid is probably the most often overlooked serious source of error in gas solubility measurements.

#### APPARATUS AND PROCEDURES

In the compiled tables brief mention is made of the apparatus and procedure. There are several reviews on experimental methods of determining gas solubilities and these are given in References 1-7.

#### METHODS OF EXPRESSING GAS SOLUBILITIES

Because gas solubilities are important for many different scientific and engineering problems, they have been expressed in a great many ways:

The Mole Fraction, X(g)

The mole fraction solubility for a binary system is given by:

$$X(g) = \frac{n(g)}{n(g) + n(1)}$$

 $= \frac{W(g)/M(g)}{\{W(g)/M(g)\} + \{W(1)/M(1)\}}$ 

here n is the number of moles of a substance (an *amount* of substance), W is the mass of a substance, and M is the molecular mass. To be unambiguous, the partial pressure of the gas (or the total pressure) and the temperature of measurement must be specified.

The Weight Per Cent Solubility, wt%

For a binary system this is given by

 $wt = 100 W(g) / \{W(g) + W(1)\}$ 

where W is the weight of substance. As in the case of mole fraction, the pressure (partial or total) and the temperature must be specified. The weight per cent solubility is related to the mole fraction solubility by

$$X(g) = \frac{\{wt \frac{M}{g}\}}{\{wt \frac{M}{g}\} + \{(100 - wt \frac{M}{g})\}}$$

The Weight Solubility,  $\ensuremath{C_W}$ 

The weight solubility is the number of moles of dissolved gas per gram of solvent when the partial pressure of gas is 1 atmosphere. The weight solubility is related to the mole fraction solubility at one atmosphere partial pressure by

X(g) (partial pressure 1 atm) =  $\frac{C_w M(1)}{1 + C_w M(1)}$ 

where M(1) is the molecular weight of the solvent.

#### The Moles Per Unit Volume Solubility, n

Often for multicomponent systems the density of the liquid mixture is not known and the solubility is quoted as moles of gas per unit volume of liquid mixture. This is related to the mole fraction solubility by

$$X = \frac{n v^{0}(1)}{1 + n v^{0}(1)}$$

where  $v^{O}(1)$  is the molar volume of the liquid component.

#### The Bunsen Coefficient, $\alpha$

The Bunsen coefficient is defined as the volume of gas reduced to 273.15K and 1 atmosphere pressure which is absorbed by unit volume of solvent (at the temperature of measurement) under a partial pressure of 1 atmosphere. If ideal gas behavior and Henry's law is assumed to be obeyed,

$$\alpha = \frac{V(g)}{V(1)} \frac{273.15}{T}$$

where V(g) is the volume of gas absorbed and V(1) is the original (starting) volume of absorbing solvent. The mole fraction solubility X is related to the Bunsen coefficient by

X (l atm) = 
$$\frac{\alpha}{\alpha + \frac{273.15}{T} \frac{v^{O}(g)}{v^{O}(1)}}$$

where  $v^{O}(g)$  and  $v^{O}(1)$  are the molar volumes of gas and solvent at a pressure of one atmosphere. If the gas is ideal,

$$X = \frac{\alpha}{\alpha + \frac{273.15R}{v^{\circ}(1)}}$$

Real gases do not follow the ideal gas law and it is important to establish the real gas law used for calculating  $\alpha$  in the original publication and to make the necessary adjustments when calculating the mole fraction solubility.

#### The Kuenen Coefficient, S

This is the volume of gas, reduced to 273.15K and 1 atmosphere pressure, dissolved at a partial pressure of gas of 1 atmosphere by 1 gram of solvent. TABLE 1 Interconversion of parameters used for reporting solubility

 $L = \alpha (T/273.15)$   $C_{w} = \alpha / v_{o} \rho$   $K_{H} = \frac{17.033 \times 10^{6} \rho_{soln}}{\alpha M(1)} + 760$   $L = C_{w} v_{t,gas} \rho$ 

where v is the molal volume of the gas in  $\rm cm^3 mol^{-1}$  at 0°C,  $\rho$  the density of the solvent at the temperature of the measurement,  $\rho_{\rm soln}$  the density of the solution at the temperature of the measurement, and v, gas the molal volume of the gas (cm^3mol^{-1}) at the temperature of the measurement.

#### SALT EFFECTS

The effect of a dissolved salt in the solvent on the solubility of a gas is often studied. The activity coefficient of a dissolved gas is a function of the concentration of all solute species (see ref. 8). At a given temperature and pressure the logarithm of the dissolved gas activity coefficient can be represented by a power series in  $C_s$ , the electrolyte concentration, and  $C_i$ , the nonelectrolyte solute gas concentration

$$\log f_{i} = \sum_{m,n} k_{mn} C_{s}^{n} C_{i}^{m}$$

It is usually assumed that only the linear terms are important for low  $C_{\rm S}$  and  $C_{\rm i}$  values when there is negligible chemical interaction between solute species.

$$\log f_i = k_s C_s + k_i C_i$$

where  $k_s$  is the salt effect parameter and  $k_i$  is the solute-solute gas interaction parameter. The dissolved gas activity is the same in the pure solvent and a salt solution in that solvent for a given partial pressure and temperature

$$a_i = f_i S_i = f_i^{\circ} S_i^{\circ}$$
 and  $f_i = f_i^{\circ} \frac{s_i^{\circ}}{s_i}$ 

where  $S_i$  and  $S_i^{o}$  are the gas solubility in the salt solution and in the pure solvent, respectively, and the f's are the corresponding activity coefficients. It follows that log  $\underline{f_i} = \log \underline{S_i^{o}} = k_s C_s + k_i (S_i - S_i^{o})$ . When the

quantity  $(S_i - S_i^{O})$  is small the second term is negligible even though  $k_s$  and  $k_i$  may be of similar magnitude. This is generally the case for gas solubilities and the equation reduces to

$$\log \frac{f_i}{f_i^o} = \log \frac{s_i^o}{s_i} = k_s C_s$$

which is the form of the empirical Setschenow equation in use since the 1880's. A salt that increases the activity coefficient of the dissolved gas is said to salt-out and a salt that decreases the activity coefficient of the dissolved gas is said to salt-in.

Although salt effect studies have been carried out for many years, there appears to be no common agreement of the units for either the gas solubility or the salt concentration. Both molar (mol dm<sup>-3</sup>) and molal (mol kg<sup>-1</sup>) are used for the salt concentration. The gas solubility ratio  $S_i^{o}/S_i$  is given as Bunsen coefficient ratio and Ostwald coefficient ratio,

which would be the same as a molar ratio; Kueunen coefficient ratio, volune dissolved in 1 g or 1 kg of solvent which would be a molal ratio; and mole fraction ratio. Recent theoretical treatments use salt concentration in mol dm<sup>-3</sup> and  $S_1^{\circ}/S_1$  ratio as mole fraction ratio with each salt ion acting as a mole. Evaluations which compare the results of several workers are made in the units most compatible with present theory.

#### TEMPERATURE DEPENDENCE OF GAS SOLUBILITY

In a few cases it has been found possible to fit the mole fraction solubility at various temperatures using an equation of the form

 $\ln x = A + B / (T/100K) + C \ln (T/100K) + DT/100K$ 

It is then possible to write the thermodynamic functions  $\overline{\Delta G_1^0}, \overline{\Delta H_1^0}, \overline{\Delta S_1^0}$  and  $\Delta \overline{C}^{\circ}_{p_1}$  for the transfer of the gas from the vapor phase at

101,325 Pa partial pressure to the (hypothetical) solution phase of unit mole fraction as:

> $\Delta \overline{G}_{1}^{\circ} = -RAT - 100 RB - RCT ln (T/100) - RDT^{2}/100$  $\Delta \overline{S}_{1}^{2} = RA + RC \ln (T/100) + RC + 2 RDT/100$  $\Delta \overline{H}_{1}^{\circ} = -100 \text{ RB} + \text{RCT} + \text{RDT}^{2}/100$ ∆ē°<sub>p</sub> = RC + 2 RDT/100

In cases where there are solubilities at only a few temperatures it is convenient to use the simpler equations

 $\Delta \overline{G}_1^\circ = - RT \ln x = A + BT$ 

in which case  $A = \Delta \overline{H}_1^\circ$  and  $-B = \Delta \overline{S}_1^\circ$ .

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- Regular and Related Solutions, Van Nostrand Reinhold, New York, 1970, Chapter 8.
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   Kertes, A. S.; Levy, O.; Markovits, G. Y. in Experimental Thermochemistry II, Ed. B. Vodar and B. LeNaindre, Butterworth, London, 1974, Vol. Chapter 15.
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Non-SI Unit		l (n	) on-S k	د II (S	Jnit) : [ Unit	=	1	(SI v-1	k <sup>-</sup> Uni	L t)		+ <b>\</b>
LENGTH				(0.		<u>,                                     </u>		<u>~ -                                    </u>	SI	Ur	nit,	<u></u>
Å (angstrom) cm (centimeter) in (inch) ft (foot)		3	1 1 254 048	x x x x	10 <sup>-10</sup> 10 <sup>-2</sup> 10 <sup>-4</sup> 10 <sup>-4</sup>	(*) (*) (*) (*)	3	937 280	1 1 008 840	x x x x x	10 <sup>10</sup> 10 <sup>2</sup> 10 <sup>-5</sup> 10 <sup>-6</sup>	(*) (*)
AREA									SI	Ur	nit,	m²
cm <sup>2</sup> in <sup>2</sup> ft <sup>2</sup>	9	64 290	1 516 304	x x x	10-4 10-8 10-8	(*) (*) (*)	1	550 076	1 003 391	x x x	10 <sup>4</sup> 10-3 10-5	(*)
VOLUME									SI	Ur	nit,	m <sup>3</sup>
cm <sup>3</sup> in <sup>3</sup> ft <sup>3</sup> l (litre) UKgal (UK gallon) USgal (US gallon)	16 2	387 831 45 37	1 064 685 1 461 854	x x x x x x x x	10-6 10-12 10-8 10-3 10-7 10-7	(*) (*) (*)	6 3	102 531 21 26	1 374 467 1 997 417	x x x x x x x	10 <sup>6</sup> 10 <sup>-</sup> 2 10 <sup>-</sup> 5 10 <sup>3</sup> 10 <sup>-</sup> 2 10 <sup>-</sup> 2	(*) (*)
MASS									SI	Ur	nit,	kg
g (gram) t (tonne) lb (pound)	45	359	1 1 237	x x x	10 <sup>-3</sup> 10 <sup>3</sup> 10 <sup>-8</sup>	(*) (*) (*)	2	204	1 1 623	x x x	10 <sup>3</sup> 10-3 10-6	(*) (*)
DENSITY									SIU	nit	:, kg	m-3
g cm <sup>-3</sup> g l <sup>-1</sup> lb in <sup>-3</sup> lb ft <sup>-3</sup> lb UKgal <sup>-1</sup> lb USgal <sup>-1</sup>	2 1 1	767 601 99 198	1 991 847 776 264	x x x x x x	$10^{3}$ $10^{-2}$ $10^{-5}$ $10^{-3}$ $10^{-4}$	(*) (*)	3 6 8	612 242 100 345	1 728 795 224 406	· × × × ×	10 <sup>-3</sup> 10 <sup>-1</sup> 10 <sup>-8</sup> 10 <sup>-7</sup> 10 <sup>-9</sup>	(*) 1 <sup>(*)</sup>
PRESSURE					SI	Unit,	Pa	(pas	cal,	kg	ر س_ح	s <sup>-2</sup> )
dyn cm <sup>-2</sup> at (kgf cm <sup>-2</sup> ) atm (atmosphere) bar lbf in <sup>-2</sup> (p.s.i.) lbf ft <sup>-2</sup> inHg (inch of mercury) mmHg (millimeter of mercury, torr)	6 3 1	980 101 894 47 386 333	1 665 325 1 757 880 388 224	x x x x x x x x x x x x x x x x x x x	$10^{-1}$ $10^{-1}$ $10^{-1}$ $10^{-3}$ $10^{-3}$ $10^{-3}$ $10^{-4}$	(*) (*) (*)	1 9 1 2 7	019 869 450 20 952 500	1 716 233 1 377 886 999 617	x x x x x x x x x x x	10 10-1 10-5 10-1 10-6 10-1 10-9	1 <sup>(*)</sup> 2 0 <sup>(*)</sup> 0

•

хx

APPENDIX I. Conversion Factor	s k and k <sup>-1</sup>			
Non-SI Unit	k l (non-SI Unit) = k (SI Unit)	k <sup>-1</sup> l (SI Unit) = <u>k<sup>-1</sup> (non-SI Uni</u> t)		
ENERGY	Unit	, J (joule, kg $m^2 s^{-2}$ )		
erg cal <sub>IT</sub> (I.T. calorie) cal <sub>th</sub> (thermochemical calorie) kW h (kilowatt hour) l atm ft lbf 1 hp h (horse power hour) 2 Btu (British thermal unit) 1	$ \begin{array}{c} 1 \times 10^{-7}  (*) \\ 41 & 868 \times 10^{-4}  (*) \\ 4 & 184 \times 10^{-3}  (*) \\ 36 \times 10^{5}  (*) \\ 101 & 325 \times 10^{-3}  (*) \\ 355 & 818 \times 10^{-6} \\ 684 & 519 \\ 055 & 056 \times 10^{-3} \end{array} $	$\begin{array}{c} 1 \times 10^{7} (*) \\ 2 388 459 \times 10^{-7} \\ 2 390 057 \times 10^{-7} \\ 2 777 778 \times 10^{-13} \\ 9 869 233 \times 10^{-9} \\ 7 375 622 \times 10^{-7} \\ 3 725 062 \times 10^{-13} \\ 9 478 172 \times 10^{-10} \end{array}$		
An asterisk (*) denotes an exact relationship				

COMPONENTS:	EVALUATOR:
<ol> <li>Helium; He; 7440-59-7</li> <li>Water; H<sub>2</sub>O; 7732-18-5</li> </ol>	R. Battino Department of Chemistry Wright State University Dayton, OH 45431 USA
	April 1977

CRITICAL EVALUATION:

The data produced by eight workers were considered to be sufficiently accurate to use for the smoothing equation. However, in fitting the data those points which showed deviations greater than two standard deviations were rejected. Thus we used 59 data points obtained as follows (reference number of data points used from that reference): 1-8, 2-5, 3-5, 4-24, 5-3, 6-1, 7-1, 8-1, 9-11. The fitting equation used was

 $\ln X_1 = A + B/(T/100K) + C \ln (T/100K) + DT/100K$ (1)

Using T/100K as the variable rather than T/K gives coefficients of approximately equal magnitude. The best fit for 59 points gave

$$\ln X_1 = -41.4611 + 42.5962/(T/100K) + 14.0094 \ln (T/100K)$$
(2)

where  $X_1$  is the mole fraction solubility of helium at 101.325 Pa (1 atm) partial pressure of gas. The fit in  $\ln X_1$  gave a standard deviation of 0.54% taken at the middle of the temperature range. Table 1 gives smoothed values at 5K intervals for the mole fraction solubility at 101.325 Pa and the Ostwald coefficient.

Table 1 also gives the thermodynamic functions  $\Delta \overline{G}_1^\circ$ ,  $\Delta \overline{H}_1^\circ$ ,  $\Delta \overline{S}_1^\circ$ , and  $\Delta \overline{C}_p^\circ$  for the transfer of the gas from the vapor phase at 101.325 Pa partial 1 gas pressure to the (hypothetical) solution phase of unit mole fraction. These were calculated from the smoothing equation according to the following equations:

 $\Delta \overline{G}_{1}^{\circ} = -RAT - 100RB = RCT \ln (T/100) - RDT^{2}/100$ (3)  $\Delta \overline{S}_{1}^{\circ} = RA + RC \ln (T/100) + RC + 2RDT/100$ (4)  $\Delta \overline{H}_{1}^{\circ} = -100RB + RCT + RDT^{2}/100$ (5)  $\Delta \overline{C}_{p_{1}}^{\circ} = RC + 2RDT/100$ (6)

Since the three constant equations gave the best fit,  $\Delta \overline{C}_p^{\circ}$  is independent of temperature.

Several sets of data were rejected for purposes of the fitting equation or preparing separate data sheets. The data of Shoor, et al. (10) were obtained via a gas chromatographic method and were about  $\frac{4}{8}$  low. Friedman's single value (11) was 1.5 % low. Antropoff's values (12) were erratically very high. Hawkin's single value (13) was 12 % low. The measurements of Feillolay and Lucas (14) at 25 and 35°C were 2 to 5 percent high despite a reproducibility of ± 0.5 percent. Ramsay, Collie and Traver's (15) early value was only qualitative (± 10 %) and it is about 30 percent low. Valentiner's (16) measurements were done at three temperatures using a mixture of gases that was 70 % neon and 30 % helium. His values calculated using this mixture were only qualitative. Estreicher's measurements (17) were Very high.<sup>a</sup>

Weiss (5) also measured the solubility of  ${}^{3}$ He in water. Those data appear just following the natural helium in water data sheets.

Figure 1 shows the temperature dependence of solubility for helium obtained from the smoothing equation. There is a pronounced minimum at 303 K.

Experimental values of the partial molal enthalpy of solution and of the partial molal volume of the dissolved gas would complement the solubility data. No report of the direct calorimetric determination of the enthalpy of solution of helium in water was found. There are no reports of the partial molal volume of helium in water from experiments at atmospheric Pressure. There are reports of the partial molal volume of helium in water

COMPONENTS:	EVALUATOR:
l. Helium; He; 7440-59-7 2. Water; H <sub>2</sub> O; 7732-18-5	R. Battino Department of Chemistry Wright State University Dayton, OH 45431 USA
	April 1977

CRITICAL EVALUATION:

Table 1. Smoothed values of helium solubility in water and thermodynamic functions<sup>a</sup> using equation 1 at 101.325 kPa (1 atm) partial pressure of helium.

т/к	Mol Fraction <sup>b</sup> X <sub>1</sub> x 10 <sup>6</sup>	Ostwald <sup>C</sup> L x 10 <sup>3</sup>	Δ <sub>G</sub> <sup>O</sup> /kJ mol-l <sup>d</sup>	<b>▲</b> H <sup>O</sup> <sub>1</sub> / J mol <sup>-1</sup>	Δ <sub>S</sub> <sup>o</sup> /JK <sup>-1</sup> mol <sup>-1</sup>
273.15	7.585	9.436	26.77	-3600	-111.2
278.15	7.389	9.361	27.32	-3017	-109.1
283.15	7.237	9.330	27.87	-2435	-107.0
288.15	7.123	9.341	28.40	-1853	-105.0
293.15	7.044	9.389	28.91	-1270	-103.0
298.15	6.997	9.474	29.42	- 688	-101.0
303.15	6.978	9.594	29.92	- 105	- 99.06
308.15	6.987	9.748	30.42	+ 477	- 97.16
313.15	7.020	9.935	30.90	1059	- 95.28
318.15	7.077	10.16	31.37	1642	- 93.44
323.15	7.158	10.41	31.83	2224	- 91.62
328.15	7.261	10.70	32.28	2807	- 89.83
333.15	7.385	11.02	32.73	3389	- 88.07
338.15	7.532	11.38	33.17	3971	- 86.33
343.15	7.700	11.77	33.59	4554	- 84.62
348.15	7.890	12.20	34.01	5136	- 82.94

a ▲C<sup>o</sup><sub>p</sub> was independent of temperature and has the value ll6 J K<sup>-1</sup> mol<sup>-1</sup>.
 b The mole fraction solubility of helium at 101.325 kPa (1 atm) partial pressure of the gas.

- c Ostwald coefficient.
- d cal<sub>th</sub> = 4.184 joule.

and aqueous salt solutions derived from high pressure gas solubility data, from high pressure density data, and from a study of aqueous helium solutions under hydrostatic pressure. The values of the partial molal volume of helium in water from the high pressure studies are summarized in Table 2.

Four of the sets of values of the helium partial molal volume in water depend on the high helium pressure solubility measurements of Wiebe and Gaddy (19). Both Michaels, Gerver, and Bijl (18), and Namiot (21) have derived the partial molal volume values for helium in water from the least square fit of the Krichevskii - Kasarnovskii equation (20) to the Wiebe and Gaddy solubility data. It is generally accepted that although the Krichevskii - Kasarnovskii equation often fits the experimental gas solubility data well, the partial molal volumes derived from the equation are low. This seems to be the case for the helium and water system. Gardner and Smith (23) have fitted both the Wiebe and Gaddy and their own data to a theoretical equation which is a quadratic in pressure and which assumes a pressure dependent partial molal volume of the dissolved gas. Popov and Draken (24) calculated an apparent molal volume of helium in water from their measurement of density of the gas saturated solutions at pressures of 20 to 100 atm. They used the Wiebe and Gaddy solubility data to calculate the gas concentration in the solutions. Their value of the helium apparent molal volume is so high when compared with values by the other methods that it must be considered dubious unless it is substantiated by future work. Enns, Scholander, and Bradstreet (22) studied the equilibrium pressure of helium required to maintain a constant concentration of dissolved gas as the



COMPONENTS:	EVALUATOR:			
1. Helium; He; 7440-59-7	R. Battino			
2. Water; H <sub>2</sub> O; 7732-18-5	Wright State University			
	Dayton, OH 45431 USA			
	April, 1977			
CRITICAL EVALUATION:				
Table 2. Summary of literatu dissolved in water.	are values of the partial molal volume of helium			
T/K P/atm <sup>a</sup> V <sub>1</sub> /cm <sup>3</sup> mol <sup>-</sup>	-1 Reference and Comments			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Michaels, Gerver, and Bijl (18). High pres- sure helium solubility data of Wiebe and Gaddy (19) fitted to the Krichevskii and Kasarnovskii (20) equation.			
273.15 25 - 1000 17	Namiot (21). Same data and treatment as above.			
298.15 34 - 102 29.7 29.7	Enns, Scholander, and Bradstreet (22). A study of the helium equilibrium pressure re- quired to maintain a fixed concentration of helium dissolved in water as the hydrostatic pressure increased from 34 to 102 atm.			
298.1525 - 100014.8323.1525 - 100020.0	Gardiner and Smith (23). The Wiebe and Gaddy (19) data treated as described below.			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Gardiner and Smith (23). Their high pressure (100 - 600 atm) gas solubility data were fit- ted to a theoretical equation which was quadratic in pressure. A pressure dependent partial molal volume was assumed. They also report partial molal volumes of helium dis- solved in 1 and 4 molal aqueous NaCl solu- tions.			
298.15 20 - 100 78.4 ± 1.	9 Popov and Drakin (24). The density of the helium saturated water was measured over the pressure range and apparent molal volumes were calculated using the solubility data of Wiebe and Gaddy (19).			
<sup>a</sup> 1 atm = 101.325 kPa				
<ol> <li>Valentiner, S. Preuss. Bergakad. Clausthal Festschrift 1925, 414.</li> <li>Estreicher, S. Z. Physik. Chem. 1899, 31, 176.</li> <li>Michaels, A.; Gerver, J.; Bijl, A. Physica 1936, 3, 797.</li> <li>Wiebe, R.; Gaddy, V. L. J. Am. Chem. Soc. 1935, 57, 847.</li> <li>Krichevskii, I. R.; Kasarnovskii, J. S. J. Am. Chem. Soc. 1935, 57, 2168.</li> <li>Namiot, A. Yu. Zh. Strukt. Khim. 1961, 2, 408.</li> <li>Enns, T.; Scholander, P.; Bradstreet, E. D. J. Phys. Chem. 1965, 69, 389.</li> <li>Gardiner, G. E.; Smith, N. O. J. Phys. Chem. 1972, 76, 1195.</li> <li>Abrosimov, V.K.; Strakhov, A.N.; Krestov, G.A.; Izv. Vyssh. Ucheb. Zaved., Khim. Khim Tekhnol. 1974, 17, 1463.</li> <li>ADDED NOTE: Abrosimov, Strkhov, and Krestov (25) made five determinations of the solubility of helium in water from 10 - 45 °C and their values ranged from 13 &amp; high to 2 &amp; how</li> </ol>				
from 13 % high to 2 % low. Th data sheet for their helium s D <sub>2</sub> O is included.	he values were too erratic to use. However, a solubility values in $H_2^0 + D_2^0$ mixtures and in			

P		
COMPONENTS:		ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7		Cady, H.P.; Elsey, H.M.; Berger, E.V.
2. Water; H <sub>2</sub> O; 7732-18-5		
		J.Am.Chem. Soc. 1922, 44, 1456-1461.
VARIABLES:		PREPARED BY: R. Battino
T/K: 275.15 - 30	3.15	
EXPERIMENTAL VALUES:		-
T/K Mol Fraction $x_1 \times 10^4$	Bunsen Coefficient/	<u></u>
275.15 0.07540* 275.15 0.07523*	0.00938 0.00936	
283.15 0.07260 <sup>*</sup> 283.15 0.07139	0.00903 0.00888	
298.15 0.06949* 298.15 0.06925*	0.00862 0.00859	
303.15 0.06539 303.15 0.06482 303.15 0.06628 303.15 0.06749	0.00810 0.00803 0.00821 0.00836	
recommended solubility	values given	in the critical evaluation.
<u> </u>	AUXILIARY	INFORMATION
METHOD: 2 2 C 2		SOURCE AND DUDITY OF MATEDIALS.
determined by displacement Gentle stirring for more hours dissolves the gas. gas dissolved is determining calibrated and thermore burets.	ed water is it of mercury. than 24 The amount of ned by read- ostated gas	<ul> <li>SOURCE AND PORTH OF MAINTALS:</li> <li>1. Helium. Extracted from natural gas by liquefaction and absorption on charcoal. "Pure" by spectro- scopic examination.</li> <li>2. Water. Conductivity water.</li> </ul>
APPARATUS / PROCEDURE .	<u></u>	ESTIMATED ERROR:
Procedure and apparatus of original measurements pap	lescribed in per.	
		REFERENCES :

COMPONENTS:			ORTGINAL MEASUREMENTS .
			Lannung
l. Helium; He; 7440-	59-7		Lamung, A.
2. Water; H <sub>2</sub> O; 7732-	18-5		
L.			J. Am. Chem. Soc. 1930, 52, 68 - 80.
VARIABLES:	- 303 15		PREPARED BY:
17 17 17 17 12 10 1 1 1	505.15		R.Battino
EXPERIMENTAL VALUES:			
	Т/К Мо	l Fract	tion Bunsen
	:	X1 x 10	$0^4 \xrightarrow{\text{Coefficient}} \times 10^2$
	288.15 288.15	0.0716	6* 0.89 8* 0.88
	293.15	0.0717	7 0.89
	303.15	0.0694	τ υ.87 4* 0.86
	303.15	0.0694	4* 0.86
The mole fraction solubility at 101. the gas. The mole fraction solubilit *Solubility values which were used i the recommended values given in the			325 kPa (1 atm) partial pressure of y was calculated by the compiler. n the final smoothing equation for critical evaluation.
	AU	JAILIARY	INFORMATION
Manometric/volumetri	a procedure		BOURCE AND FURILY OF MATERIALS:
Water is degassed wh	ile setting	on	0.5 per cent neon.
buret.	measured on	gas	<ol> <li>Water. Distilled. The specific conductivity was 2 x 10<sup>-7</sup>.</li> </ol>
APPARATUS/PROCEDURE:	· · · · · · · · · · · · · · · · · · ·		ESTIMATED ERROR: $\delta T/K = 0.03$
The apparatus is bas	ed on the de	esign tus	
is designed so that	the entire a	appar-	REFERENCES :
atus is shaken in a thermostat.			<pre>1. v. Antropoff, A. Z. Elektrochem. 1919, 25, 269.</pre>

COMPONENTS:	ORIGINAL MEASUREMENTS:
l. Helium; He; 7440-59-7	AKERIOI, A.
2 Wator, $H_{0}$ , 7732-18-5	
2. water, <sup>12</sup> 2, <sup>17</sup> 52-10-5	<u>J. Am. Chem. Soc</u> . 1935, <u>57</u> , 1196-1201
VARIABLES	DDEDADED BV.
T/K: 298.15	R.Battino
_,	
EVDEDIMENTAL VALUES.	
T/K Mol Fract	zion Bunsen
× • 1(	Coefficient $\gamma_{4} \sim \gamma_{10}^{2}$
	, <u> </u>
298-15 0-0693	3* 0.86
	0.00
The mole fraction solubility at 101.32 helium was calculated by the compiler.	25 kPa (l atm) partial pressure of
*Solubility value which was used in +H	e final smoothing equation for the
recommended solubility values given in	the critical evaluation.
1	
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
Volume of solution determined by the	1. Helium. Source not given. Gas 98
direct displacement of mercury. Gas	per cent helium.
buret. Water degassed by boiling in	2. Water. No information given.
vacuum.	
APPARATUS / PROCEDURE :	ESTIMATED ERROR:
Details of procedure and diagram of	
	REFERENCES :
1	

COMPONENTS:	ORIGINAL MEASUREMENTS:
l. Helium; He; 7440-59-7	Behnke, A.R.; Yarbrough, O.D.
2. Water: H_O: 7732-18-5	
	II S Nav Med Bull 1938 36 542 -
	548.
VARIABLES:	PREPARED BY:
т/к: 311.15	R. Battino
EXPERIMENTAL VALUES:	
T/K Mol Fract	 ion Bunsen
X <sub>1</sub> x 10	$^{4}$ $\stackrel{\text{Coefficient}}{\swarrow} \times 10^{2}$
311.15 0.0705	
The mole fraction solubility at 101.32	
gas. The mole fraction solubility calc	ulated by the compiler.
*Solubility value which was used in th recommended solubility values given in	le final smoothing equation for the the critical evaluation.
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
	<ol> <li>Helium. Source not given. 97.65 percent helium.</li> </ol>
	2. Water. No information given.
	ESTIMATED ERROR:
APPARATOS/PROCEDURE:	
Used the Van Slyke procedure (1).	
	REFERENCES:
	1. Van Slyke, D.D.; Dillon, R.T.;
	Margaria, R. <u>J. Biol</u> . <u>Che</u> m. 1934, 105, 571.
	1

COMPONENTS:	ORIGINAL MEASUREMENTS:		
	Morrison, T.J.; Johnstone, N.B.		
1. Helium; He; 7440-59-7			
2. Water; H <sub>2</sub> O; 7732-18-5	$I_{\rm chom}$ Sec. 1954 2441 - 2446		
	$\frac{1}{2} = \frac{1}{2} = \frac{1}$		
VARIABLES: $\pi/k$ , 277 75 - 346 15	PREPARED BY:		
1/10 2//0/5 540.15	R. Baccino		
EXPERIMENTAL VALUES:	T/K Mol Fraction Kuenen		
Coefficient	Coefficient		
$X_1 \times 10^4$ S × 10 <sup>3</sup>	$x_1 \times 10^{-1}$ S $\times 10^{-1}$		
277.75 0.07588 9.44	313.55 0.06814 8.41		
279.15 0.07515 9.35	318.05 0.06858 8.45		
285.15 0.07213* 8.97	327.55 0.07100 8.71		
286.35 0.07134* 8.87	329.05 0.07187 8.81		
289.75 0.07009 8.71	331.75 0.07262 8.89		
294.85 0.06871 8.53	333.65 0.07376 9.02		
297.85 0.06827 8.47 300 55 0.06816 8.45	240.55 0.07576 9.25 242.65 0.07746 9.42		
306.15 0.06739 8.34	344.55 0.07750* 9.42		
307.75 0.06799 8.41	346.15 0.07790* 9.46		
The original paper reports the helium solubility in water, S <sub>o</sub> , as cm <sup>3</sup> of helium at a partial pressure 760 torr, reduced to 760 torr and 273.15 K, dissolved by 1 kg water. The same solubility value is reported above as the Kuenen coefficient x 10 <sup>3</sup> at a helium partial pressure of 101.325 kPa (1 atm) The mole fraction solubility at a helium partial pressure of 101.325 kPa (1 atm) The mole fraction solubility at a helium partial pressure of 101.325 kPa (1 atm) The mole fraction solubility at a helium partial pressure of 101.325 kPa (1 atm) The mole fraction solubility at a helium partial pressure of 101.325 kPa (1 atm) The authors solubility values given in the final smoothing equation for the recommended solubility values given in the critical evaluation. The authors fitted their solubility data to the equation log <sub>10</sub> S <sub>o</sub> = -58.987 + 2740/(T/K). METHOD: The previously degassed solvent is flowed in a thin film through the gas in a glass absorption spiral. Volume changes are measured in burets. 2. Water. No information given.			
APPARATUS/PROCEDURE: The apparatus described by Morrison and Billett (1) was used.	- ESTIMATED ERROR: REFERENCES: 1. Morrison, T.J.; Billett, F. J. <u>Chem</u> . <u>Soc</u> . 1952, 3819.		

.

COMPONENTS:		ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7		de	Wet, W.J.		
2. Water; H <sub>2</sub> O; 7732-	-18-5				
2			J.	S. Afr. Chem.	<u>Inst</u> . 1964, <u>17</u> , 9-13
VARIABLES:			PREPA	ARED BY:	
т/к: 291.25	- 305.75			R. Bat	tino
EXPERIMENTAL VALUES:					
			tion Bunsen		
	1/1		e1011	Coefficient	
		x <sub>1</sub> x 10		<b>Q</b> X 10 <sup>-</sup>	
	291.25	0.0716	5	0.89	
	298.45	0.0709		0.88	
	305.75	0.0695	5	0.86	
Mole fraction solubi helium calculated by *Solubility value wh	ility at y the com	101.325 kH piler. used in +H	Pa (1 ne fi	atm) partial	pressure of the
recommended solubili	ity value	s given in	the the	critical eva	luation.
<u> </u>		AUXILIARY	INFO	RMATION	
METHOD:			SOUR	CE AND PURITY OF	MATERIALS:
Degassed liquid is	flowed in	n a thin	11.	Helium. Conta	ined less than 0.3
film through a glass spiral contain- ing the gas. Volumes determined via calibrated burets.		per cent impurity. Passed over activated charcoal at liquid air temperatures.			
		2. Water. Distilled.			
			ESTI	MATED ERROR:	
APPARATUS/PROCEDURE:					
Used modification of Billett (1) apparat	of Morris	on and ssing as			
modified by Clever,	et al.(	2).	REF	ERENCES :	
			1.	Morrison, T.J J. <u>Chem</u> . <u>Soc</u> . Ibid. 1952. 3	.; Billett, F. 1948, 2033; 819.
					Patting D .
			2.	Saylor, J. H. J. Phys. Chem	; Gross, P.M. . 1957, <u>61</u> , 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7	Weiss, R.F.
2. Water; H <sub>2</sub> O; 7732-18-5	
	Caterra 1070 169 247
VAPTABLEC .	<u>Science</u> 1970, <u>168</u> , 247
T/K: 273.15 - 313.29	R. Battino
EXPERIMENTAL VALUES:	
T/K Mol Fraction Bunsen $X_1 \times 10^4$ Coefficient/ $\alpha$	
273.75 0.07520 <sup>*</sup> 0.009355	
293.26 0.07025 <sup>*</sup> 0.008724	
313.29 0.07058* 0.008713	
The mole fraction solubility is at 10 the helium. The mole fraction solubil	01.325 kPa (1 atm) partial pressure of Lity was calculated by the compiler.
*Solubility values which were used in recommended solubility values given i	the final smoothing equation for the n the critical evaluation.
AUXILIARY	INFORMATION
METHOD: The Scholander micro-gasometric	SOURCE AND PURITY OF MATERIALS:
technique as adapted by Douglas (1) was used. The gas is dissolved in	<ol> <li>Helium. Air Reduction reactor grade. Better than 99.99 per cent.</li> </ol>
previously degassed water over mercury All volumes are read on a micrometer	2. Water. Distilled.
which displaces mercury.	
APPARATUS/PROCEDURE:	ESTIMATED ERROR:
	DEFEDENCES.
	Louglas, E. J. Phys. Chem. 1964, <u>68</u> ,
	100; IDIG., 1965, <u>69</u> , 2608.

COMPONENTS:	ORIGINAL MEASUREMENTS:		
l. Helium; He; 7440-59-7	Weiss, R.F.		
2. Water; H <sub>2</sub> O; 7732-18-5			
2			
	J.Chem.Eng.Data 1971, 16, 235-241.		
VARIABLES:	PREPARED BY		
т/к: 273.75 - 313.30	R. Battino		
EXPERIMENTAL VALUES:			
T/K Mol Fraction Bunsen T $X_1 \times 10^4$ Coefficient	$X_1 \times 10^4$ Coefficient		
273.75 0.07525* 0.009361 3	803.41 0.06974* 0.008639		
273.75 0.07518* 0.009353 3 273.75 0.07521* 0.009356 3	03.39 0.06953* 0.008612		
273.75 0.07517* 0.009351	03.39 0.06944* 0.008601		
283.42 0.07267* 0.009038	03.40 0.06953* 0.008612		
283.44 0.07218* 0.008978			
283.43 0.07242* 0.009008 283.44 0.07218* 0.008978	13.29 0.07021* 0.008667		
283.44 0.07236* 0.009000	13.30 0.07071* 0.008729		
293.25 0.07018* 0.008716	13.29 0.07052* 0.008705		
293.26 0.07047* 0.008752			
293.26 0.07005 <sup>*</sup> 0.008700 293.26 0.07042 <sup>*</sup> 0.008746			
293.23 0.07033* 0.008734			
293.28 0.07001* 0.008695			
The mole fraction solubility is at 10 the helium. The mole fraction solubil	1.325 kPa (1 atm) partial pressure of ity was calculated by the compiler.		
*Solubility values which were used in	the final smoothing equation for the		
recommended solubility values given i	n the critical evaluation.		
. AUXILIARY	INFORMATION		
METHOD: The Scholander micro-gasometric SOURCE AND PURITY OF MATERIALS:			
technique as adapted by Douglas (1)	1. Helium. Air Reduction. Better than		
previously degassed water over	99.99 per cent nellum.		
mercury. All volumes are read on a micrometer which displaces mercury	2. Water. Distilled.		
micrometer which displaces mercury.			
APPARATUS/PROCEDURE:	ESTIMATED ERROR:		
	$\delta T/K = 0.01$		
	DEEEDENCEC.		
	Douglas F		
	J. Phys. Chem. 1964, 68, 169;		
	<u>ibid</u> . 1965, <u>69</u> , 2608.		

COMPONENTS:		ORIGINAL MEASUREMENTS:	
		Benson, B.B.; Krause, D.	
l. Helium; He; 7440-59-7			
2. Water; H <sub>2</sub> O; 7732-18-5			
2		T Chem Phys 1976 64 699 - 709	
		<u> </u>	
VARIABLES:		PREPARED BY:	
T/K: 274.15 - 325.15		R. Battino	
EXPERIMENTAL VALUES:			
т/к	Mol Fract	ion Bunsen	
	x <sub>1</sub> x 10	$4 \xrightarrow{\text{Coefficient}} 4 \xrightarrow{\text{coefficient}} 4$	
274.151	0.07630	0.9502	
278.143	0.07438	8* 0.9264	
278.145	0.07445	05 U.9272	
283.147	0.07174		
288.149 288.152	0.07168	5 <sup>*</sup> 0.8920	
293.150	0.07080	0.8801	
298.147	0.07052	2* 0.8757	
303.159	0.07030	0.8717	
308.153	0.07037	0.8712	
313.153	0.07083	0.8754	
318.152	0.07127	76 <sup>*</sup> 0.8789	
325.153	0.07185	55* 0.8910	
The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of helium was calculated by the compiler. *Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.			
Manuar	AUXILIARI		
are equilibrated, and volumet	pure gas	SOURCE AND PURITY OF MATERIALS:	
les of the liquid and gaseous	phases	1. Helium. No information given.	
water is extracted and the num	ed in the mber of	2. Water. No information given.	
moles determined on a special	mercury		
or, the number of moles of he	ater vap- lium in		
the gaseous phase sample is mo with the same manometer. The u	easured		
(and fugacity) above the solution	tion may		
Real gas corrections are made	analysis . Predic-	•	
ted maximum error is 0.02 per	cent.	ESTIMATED ERROR: Smoothed data fit to	
A PARATUS/PROCEDURE:		0.12 per cent rms in the solubility.	
NO drawings of the apparatus a given in the original paper.	are	Calculated error from measurements is 0.02 per cent.	
		REFERENCES:	
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1			
1			

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COMPONENTS :	ORIGINAL MEASUREMENTS:		
1. Helium: He: 7440-59-7	Abrosimov, V.K.: Strakhov, A.N.:		
	Krestov, G.A.		
2. Water-d <sub>2</sub> ; D <sub>2</sub> O; 7789-20-0			
	T West Watche Toward Whim		
	<u>Khim. Tekhnol</u> .1974, <u>17</u> , 1463-1465.		
VARIABLES:	PREPARED BY:		
T/K: 283.38 - 318.45 P/kPa: 101.325 (l atm)	R. Battino		
-,			
EXPERIMENTAL VALUES:			
T/K Mol Fract	tion Bunsen Coefficient		
X <sub>1</sub> x 10	$\alpha \times 10^2$		
	76 1.148 598 1.076		
298.15 0.085	76 1.060		
	941 1.050		
Mole fraction solubility at 101.325 Pa	a (1 atm) partial pressure of gas		
calculated by compiler.			
AUXILIARY	INFORMATION		
The authors also measured the	SOURCE AND FURITI OF MATERIALS;		
solubility of helium in pure water			
and mixtures of $H_2^0$ and $D_2^0$ .			
APPARATUS/PROCEDURE:	ESTIMATED ERROR:		
The apparatus (1) is a modification	$\delta \mathbf{x} / \mathbf{x} = 0.01$ (compiler)		
of the apparatus used by Ben-Naim and			
	DEFEDENCES.		
	LEFERENCES:		
	<u>Zh. Fiz. Khim. 1970, 44</u> , 1835.		
	2 Pon-Naim A : Paor S		
	Trans. Faraday Soc. 1963, <u>59</u> ,		
	2735.		

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COMPONENTS:	ORIGINAL MEASUREMENTS:	
l. Helium-3; <sup>3</sup> He; 14762-55-1	welss, R.F.	
2. Water; H <sub>2</sub> O; 7732-18-5		
	<u>Science</u> 1970, <u>168</u> , 247 - 248.	
VARIABLES:	PREPARED BY:	
T/K: 273.75 - 313.29	H.L. Clever	
P/kPa: 101.325 (1 atm)		
EXPERIMENTAL VALUES:		
T/K Bunsen Coefficient α x 10 <sup>2</sup>	Coefficient L x 10 <sup>2</sup>	
273.75 0.9254 ± 0.002	6 0.9274	
293.26 0.8620 <u>+</u> 0.001	.6 0.9255	
313.29 0.8574 ± 0.001	9 0.9834	
The Bunsen coefficients are the mean o	of 4 and 5 measurements.	
The Ostwald coefficients were calculat	ed by the compiler.	
AUXILIARY	INFORMATION	
METHOD: The Scholander microgasometric	SOURCE AND PURITY OF MATERIALS:	
technique as adapted by Douglas (1) Was used. The equilibrium chamber was	1. Helium-3. Monsanto Research.	
enlarged to contain approximately 10	with $^{3}\text{He}/^{4}\text{He} = 10^{4}$ .	
degassing the water and transferring	2. Water. No information given.	
the gas were checked for air contamin- ation by gas chromatography. All vol-	·	
umes were read on a micrometer which		
displaces mercury.		
APPARATUS (PROCEDURE	ESTIMATED ERROR:	
	Bunsen coefficient 0.3 per cent.	
	REFERENCES :	
	L.Douglas, E.	
	J. Phys. Chem. 1964, 68, 169;	
	TDIG. 1905, 09, 2008.	

COMPONENTS:	EVALUATOR:
l. Helium; He; 7440-59-7 2. Sea Water	H. L. Clever Department of Chemistry Emory University Atlanta, Georgia 30322 U.S.A.
	January 1978

CRITICAL EVALUATION:

Evaluation of the Solubility of Helium in Sea Water.

There are three reports of the solubility of helium in sea water (1,2,3). König (1) reports helium solubility values at four temperatures which he estimates to have an uncertainty of five percent. Weiss (2,3) reports four to five helium solubility values at each of five temperatures which he estimates to have an uncertainty of one-half of one percent. The three sets of data agree within the accuracy estimates of the two authors.

Presented here are the helium Bunsen solubility values determined by Weiss in water, sea water and in two dilutions of sea water. Weiss has fitted his data by the method of least squares to an equation for the natural logarithm of the Bunsen coefficient,  $\alpha$ , which is consistent with both the integrated form of the Vant Hoff equation and the Setschenow salt effect equation. The equation, which is valid for the temperature range of 272.15 to 313.15 K and the salinity range of 0 to 40 S % reproduced Weiss' helium Bunsen values with root-mean-square deviation of 2 x 10<sup>-5</sup> at S % = 18.152. The equation is

 $\ln \alpha = - 34.6261 + 43.0285 (100/T) + 14.1391 \ln (100/T)$ 

+ S %. [-0.042340 + 0.022624 (T/100) - 0.0033120 (T/100)<sup>2</sup>]

Weiss gave equations for the solubility of helium from moist air at one atm total pressure in units of ml He(STP) dm<sup>-3</sup> sea water and ml He(STP) kg<sup>-1</sup> sea water which assumed that the helium behaves as an ideal gas and has a mol fraction of  $5.24 \times 10^{-6}$  (3) in dry air. The equations are

 $\ln[m1 \text{ He}(\text{STP}) \text{ dm}^{-3}] = -152.9405 + 196.8840 (100/T) + 126.8015 \ln (T/100)$ 

- 20.6767 (T/100) + S %. [-0.040543 + 0.021315 (T/100)

-0.0030732 (T/100)<sup>2</sup>]

and

 $\ln[m1 \text{ He}(\text{STP}) \text{ kg}^{-1}] = -167.2178 + 216.3442 (100/T) + 139.2032 \ln (T/100)$ 

- 22.6202 (T/100) + S %. [-0.044781 + 0.023541 (T/100)

 $-0.0034266 (T/100)^{2}$ ]

Weiss' paper (2) gives extensive tables of the helium Bunsen coefficient and of the ml He(STP) from moist air  $kg^{-1}$  sea water as a function of temperature and salinity as calculated from the above equations.

In addition to the natural helium solubility in sea water, Weiss also reports the solubility of  $^{3}$ He in sea water. The  $^{3}$ He solubility data sheet follows the natural helium solubility data sheet.

1. König, H. Z. Naturforsch. 1963, 18a, 363.

2. Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235.

3. Weiss, R. F. Science 1970, 168, 247.

4. Glukauf, E. <u>Proc. Roy. Soc. A 1946, 185</u>, 98. and <u>Compendium of Meteorology</u>, American Meteorological Soc., Boston, MA 1951, 3 - 11.

COMPONENTS :	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7	Weiss, R. F.
2. Sea Water	
	J. <u>Chem</u> . <u>Eng</u> . <u>Data</u> 1971, <u>16</u> , 235-241.
VARTARIES.	
T/K: 271.57 - 313.61	PREPARED BY:
Salinity /mil-1: 0 - 36.425	H.L.Clever, S.A.Johnson
EXPERIMENTAL VALUES: 10 152 Sali	nity 0/8° (CO
$\frac{0.0}{T/K}$ Bunsen T/K Bunsen	T/K Bunsen T/K Bunsen
<u> </u>	$\frac{x \ 10^3}{x \ 10^3}$ $\frac{x \ 10^3}{x \ 10^3}$
	271.57 7.977 273.21 7.766
273.75 9.356 278.21 8.346	271.57 7.980 273.21 7.795
273.75 9.351 278.22 8.387	273.22 7.764
278.22 8.367	277.07 7.746 273.23 7.795
283.43 9.008 278.22 8.371	2//.0/ /./14 283./2 /.554
283.44 8.978	283.11 7.610 283.72 7.538
283.44 9.000	283.11 7.637 283.72 7.471
	283.11 7.642 283.73 7.462
293.23 8.734	293 40 7 535 293 27 7 464
293.26 8.752	293.40 7.511 293.29 7.409
293.26 8.700 298.29 8.018	293.40 7.537 293.29 7.402
293.26 8.746 298.29 8.034	293.30 7.405
	298.26 7.453 298.26 7.474 303.28 7.402
303.37 8.602	298.26 7.503 303.29 7.457
303.39 8.612	303.29 7.407
303.39 8.635	303.50 7.510 303.30 7.431
	303.50 7.532 303.30 7.435
303.40 8.612	313.61 7.487
303.41 8.639	313.61 7.488
	313.31 7.646 313.61 7.471
313.29 8.667 313.29 8.750	313.31 7.642
313.29 8.705 AUXILIA	
313.30 8.729	
the Scholander microgrammetric tech-	SOURCE AND PURITY OF MATERIALS:
nique as used by Douglas (1), with	> 99,99 % pure. Gas chromato-
minor modification.	graphic checks showed $\leq 0.01$ %
	air.
	2 Son Wator Bassod through 0 45 u
	millipore filter and poisoned
	with 1 mg/l of HgCl <sub>2</sub> .
	-
APPARATUS/PROCEDURE: An equilibrium	$\frac{1}{2} \sum_{n=1}^{\infty} \sum_{n=1}^$
Chamber, containing pure gas satu-	$\delta salinitv = 0.004 $
i rated with water vapor, is separated	
Containing degassed water. The appa	-
ratus is tipped on its side, allowin	g REFERENCES:
degassed water to flow into the	1. Douglas, E. J. Phys. Chem. 1964,
aided by mechanical shaking	b8, 109.
of meenantear bhaking,	<u> </u>
1	1

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COMPONENTS:		ORIGINAL MEASUREMENTS:	
l. Helium; He; 7440-59-7		Weiss, R.F.	
2. Sea Water			
		Science 1970,	168, 247-248.
VARIABLES: T/K: 273.21 - 313.61		PREPARED BY:	AJohnson
P/kPa: 101.325 (1 atm)		5.	
Salinity/mil <sup>-1</sup> : 36.425			
EXPERIMENTAL VALUES:	ISED	Ostwald	
	icient 10 <sup>2</sup>	Coefficient L x 10 <sup>2</sup>	
273.21 0.777	1 ± 0.0	0025 0.7773	
293.28 0.742	20 ± 0.0	0.7967	
313.61 0.748	38 ± 0.0	0.8597	
The Bunsen coefficients are the	mean o	of 4 or 5 measu	rements.
The Ostwald coefficients were c	alculat	ed by the comp	iler.
			:
AU	XILIARY	INFORMATION	
METHOD:	otria	SOURCE AND PURITY	OF MATERIALS:
technique as adapted by Douglas	(1)	l. Helium. Air	r Reduction Co.
was used. The equilibrium chamb was enlarged to contain approxi	er mately	Reactor gra percent He.	ade, better than 99.99 . The ratio <sup>3</sup> He/ <sup>4</sup> He was
10 ml solvent. The procedures for		less than 1	10 <sup>-6</sup> .
the gas were checked for air co	ntam-	2. Sea Water.	No information given.
volumes were read on a micromet	All er		
which displaced mercury.			
		ESTIMATED ERROR:	
RITRATOS/TROCEDORE:			
		REFERENCES:	
			2
		J. Phys. C	2. <u>Chem</u> . 1964, <u>68</u> , 169;
		<u>ibid</u> . 1965	5, <u>69</u> , 2608.
1			
A Annual State of a		1	
COMPONENTS :	ORIGINAL MEASUREMENTS:		
--	---		
1. Helium-3; He: 14762-55-1	Weiss, R.F.		
2. Sea Water			
	raionao 1970 169 247 - 249		
	<u>berence</u> 1970, <u>100</u> , 247 - 240.		
VARIABLES: T/K: 273.21 - 313.61	PREPARED BY:		
P/kPa: 101.325 (1 atm)	S.A.Johnson		
Salinity/mil <sup>-+</sup> : 36.425 EXPERIMENTAL VALUES:			
	Ostupld		
T/K Bunsen Coefficient	Coefficient		
α x 10 <sup>2</sup>	$L \times 10^2$		
273.21 0.7655 ± 0.001	2 0.7657		
293.28 0.7339 ± 0.000	9 0.7880		
313.61 0.7346 ± 0.002	8 0.8434		
·			
The Bunsen coefficients are the mean o	f four measurements.		
The Ostwald coefficients were calculat	ed by the compiler.		
	-		
AUXILIARY	INFORMATION		
METHOD: The Scholander microgasometric	SOURCE AND PURITY OF MATERIALS:		
technique as adapted by Douglas (1) was used. The equilibrium chamber was	1. Helium-3. Monsanto Research.		
enlarged to contain approximately 10	Greater than 99.97 per cent helium		
ml of solvent. The procedures for	with they the - 10 .		
the gas were checked for air contamin-	2. Sea Water. No information given.		
ation by gas chromatography. All volum	es		
were read on a micrometer which dis- placed mercury.			
-			
	ESTIMATED ERROR:		
APPARATUS / PROCEDURE :			
	Bunsen coerricient 0.4 per cent.		
	REFERENCES:		
	1. Douglas, E.		
	ibid. 1965. 69. 2608.		
	, <u></u> , <u></u> , <u>_</u> _, <u>_</u> _,		

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COMPONENTS:	EVALUATOR:
l. Helium; He; 7440-59-7	H. L. Clever Chemistry Department
2. Water; H <sub>2</sub> O; 7732-18-5	Emory University
3. Electrolyte	Atlanta, GA 30322 USA
	February 1978

CRITICAL EVALUATION: The Solubility of Helium in Electrolyte Solutions.

TABLE 1. The salt effect parameter, k<sub>sX</sub>, for helium dissolved in various elctrolyte solutions.

Solvent System	т/к	$k_{SX} = (1/m) \log (X^{O}/X)$				
		Akerlof 1935 (3)	Morrison, C Johnstone R 1955 (4) 1	Clever, Reddy .964 (7)	Feillolay, Lucas 1972 (6)	Shoor, Walker, Gubbins 1969 (5)
кон + н <sub>2</sub> о	298.15 313.15 333.15 353.15					0.15 <sup>a</sup> 0.15 <sup>a</sup> 0.15 <sup>a</sup> 0.15 <sup>a</sup>
нсі + н <sub>2</sub> 0	298.15		0.023			
нс10 <sub>4</sub> + н <sub>2</sub> 0	298.15	-0.034				
$HNO_3 + H_2O$	298.15		0.002			
LiCl + H <sub>2</sub> O	298.15	-0.017	0.065			
$LiI + H_2O$	298.15	-0.028	0 096			
NaBr + $H_2O$	298.15	0.007	0.102			
ксі + н <sub>2</sub> б	298.15	0.069	0.083			
кі + н <sub>2</sub> 0	298.15		0.098			
$NaNO_3 + H_2O$	298.15	0.064				
$Na_2SO_4 + H_2O$	298.15		0.141			
BaCl <sub>2</sub> + H <sub>2</sub> O	298.15		0.109			
$NH_4C1 + H_2O$	298.15		0.042			
$(CH_3)_{4}NI + H_2O$	298.15		0.014			
$(C_{2}H_{5})_{4}NBr + H_{2}C_{5}$	J298.15 J298.15		-0.009		-0.017	
(04-19/4-121 · 112)	308.15				-0.033	
NaI + CH <sub>3</sub> OH	303.15			0.116		

a These values are  $(1/C) \log (X^O/X)$ , but for KOH solutions near unit molarity the molar and molal values differ by only about one percent. The values for KOH + H<sub>2</sub>O are a factor of 10 greater than reported in the original paper which appears to contain a decimal error.

There are four reports (3,4,5,6) of the solubility of helium at 1 atm in aqueous salt solutions, and there is one report (7) of the solubility of helium at 1 atm in a methanol and salt solution.

The results are summarized below as the Setschenow salt effect parameter,  $K_{SX} = (1/m) \log(X^{\circ}/X)$  where m is the salt molality and X°/X is the mole fraction ratio of the helium solubility in the pure solvent, X°, to the helium solubility in the salt solution, X. This form of the salt effect parameter has come into use in the past several years as a result of the theoretical developments based on scaled particle theory (1,2).

Actually the theory defines the salt effect parameter as  $k_s = (1/C)\log(X^{\circ}/X)$  in the limit C+O, where C is the electrolyte concentration in moles dm<sup>-3</sup>. In the limit of infinite dilution  $k_{sc}$  and  $k_{sx}$  should go to the same value in aqueous solutions. Much of the literature's salt effect data are in the form of an S°/S ratio where S° is the gas volume (STP) dissolved

EVALUATOR:

USA

H. L. Clever

Chemistry Department

Emory University Atlanta, GA 30322

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H<sub>2</sub>O; 7732-18-5

3. Electrolyte

CRITICAL EVALUATION:

in 1.000 kg of pure solvent, and S is the gas volume (STP) dissolved in the salt solution containing 1.000 kg of solvent.

The relationship between the X°/X and S°/S ratios is

$$X^{\circ}/X = \frac{S^{\circ}/V_{\rm m}}{1000/M} / \frac{S/V_{\rm m}}{(1000/M) + m_{\rm M}^{+} + m_{\rm h}^{-}}$$

where  $V_m$  is the molar volume of the gas at 273.15 K and 101.325 kPa (1 atm), and M is the solvent molecular weight, and  $m_{M+}$  and  $m_{A-}$  are the molalities of the salt cation and anion, respectively.

For a one molal solution of a 1 - 1 electrolytes dissolved in water

 $X^{\circ}/X = 57.50 S^{\circ}/55.50 S$ 

and  $k_{sx} = (1/1)\log(X^{\circ}/X) = \log(S^{\circ}/S) + \log(57.50/55.50) = \log S^{\circ}/S + 0.015$ 

The salt effect parameters, k<sub>Sx</sub>, are summarized in Table 1.

Akerlof's (3) tabulation of values appears to contain several errors. Akerlof reports a helium in water Bunsen coefficient of 0.0086 which he compares with Lannung's earlier value of 0.0087. Akerlof appears to have used the Lannung value in his calculation of the salt effect parameters. We have recalculated the values using Akerlof's value for helium in water. In addition Akerlof's values of  $k_s$  for helium in aqueous LiCl and aqueous LiI are not consistent with the salt molalities and helium solubilities reported in the paper. They have been recalculated using the molalities and solubilities in the paper.

Both the Morrison and Johnstone (4) and the Akerlof (3) salt effect parameters are based on only two solubility measurements, the solubility of helium in pure water and the solubility of helium in one salt solution. Morrison and Johnstone used a salt concentration near 1 g. equivalent Kg<sup>-1</sup> H<sub>2</sub>O and estimate an uncertainty of 0.010 in k<sub>s</sub>. Akerlof used much higher salt concentrations. Both Akerlof (3) and Morrison and Johnstone (4) report salt effect parameters for helium in LiCl, NaCl, and KCl solutions.

The  $k_{\rm SX}$  values of the two laboratories do not agree within the expected experimental error for the three salt solutions. The  $k_{\rm SX}$  values for aqueous LiCl even differ in sign. The difference in values may reflect a concentration effect on  $k_{\rm SX}$  but more experimental work is needed to confirm such an effect. At present we recommend the Morrison and Johnstone values as the more probable values, especially for comparison with theories that apply in the limit of infinite dilution.

Both Shoor, Walker and Gubbins (5) and Feillolay and Lucas (6) carried out their studies as a function of both temperature and salt concentration. Both of their data sets appear to be internally consistent, and are recommended as tentative values. Feillolay and Lucas (6) have theoretical reasons to suggest the  $k_s$  values go through a maximum at a salt concentration some place between 1 and 2 molal. Their experimental data appear to show the predicted trend at two temperatures, but more studies of this point are needed to make a convincing case. In Table 1 we have recorded only the average  $k_{SX}$  value, but Feillolay and Lucas' complete set of data are given on the data page for their paper.

The  $k_{sx}$  value for helium dissolved in NaI and CH<sub>3</sub>OH based on the report of Clever and Reddy (7) appears to fall within the same numerical range expected for helium in NaI and H<sub>2</sub>O. The value contains uncertainties because of assumptions about the solution vapor pressure and the validity of Henry's law in the system.

COMPONENTS:	EVALUATOR:
l. Helium; He; 7440-59-7	H. L. Clever Chemistry Department
2. Water; H <sub>2</sub> O; 7732-18-5	Emory University Atlanta, Georgia 30322
3. Electrolyte	USA
CRITICAL EVALUATION:	
1. Shoor, S. K.; Gubbins, K. E. J. 2. Masterton, W. L.; Lee, T. P. J.	Phys. Chem. 1969, 73, 498. Phys. Chem. 1970, 74, 1776
3. Akerlof, G. J. Am. Chem. Soc. 19	35, <u>57</u> , 1196.
5. Shoor, S. K.; Walker, R. D., Jr.; 73. 312.	Gubbins, K. E. J. Phys. Chem. 1969,
6. Feillolay, A.; Lucas, M. J. Phys 7. Clever, H. L.; Reddy, G. S. J. C	. Chem. 1972, 76, 3068. hem. Eng. Data 1963, 8, 191.
Values of Bunsen coefficients for heli	novskaya (8) give a table of smoothed um dissolved in aqueous sodium chloride
Morrison and Johnstone (9) and the hel	ium solubility in sodium chloride
the Evaluator, and the Setschenow para	meters were not included in the
Bunsen coefficients from $278.15 - 318$ .	15 K and NaCl concentrations from 0 -
the 40 degree range as quoted by Mishn	ina, Avdeeva, and Bozhovskaya (8).
8. Mishnina, T.A.; Avdeeva, O.I.; Boz	hovskaya, T.K. <u>Materialy</u> <u>Vses</u> .
9. Morrison, T.J.; Johnstone, N.B. J. 10. Cherepennikov, A. A. Coll, Reports	<u>Chem. Soc. 1954, 3441.</u>
	<u> </u>

COMPONENTS:	ORIGINAL MEASUREMENTS:			
1 Holium, No. 7440-50-7	Morrison, T.J.; Johnstone, N.B.B.			
1. AETIUM, AE, 7440-59-7				
2. water; H <sub>2</sub> O; //32-18-5	J. Chem. Soc. 1955, 3655-3659.			
3. ACIDS				
VARIABLES:	PREPARED BY:			
T/K: 298.15 P/kPa: 101.325 (1 atm)	T.D.Kittredge, H.L.Clever			
EXPERIMENTAL VALUES:				
T/K $k_s = (1/m) \log (S^O/S) k_{sX}$	$= (1/m) \log (X^{O}/X)$			
Hydrochloric acid; HCl; 7647-01-0				
298.15 0.008	0.023			
Nitric acid; HNO <sub>3</sub> ; 7697-37-2				
298.15 -0.013	+0.002			
The values of the Setschenow salt effect parameters, $k_s$ , were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S <sup>O</sup> , and the solubility of helium in a near one equivalent of acid per 1.000 kg of water solution, S. Neither solubility value is given in the paper. The S <sup>O</sup> /S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter $k_{sx}$ from the mole fraction solubility ratio X <sup>O</sup> /X. The acids were assumed to be 100 per cent ionized and both cation and anion were used in the mole fraction.				
AUXILIARY	INFORMATION			
METHOD:	SOURCE AND PURITY OF MATERIALS:			
Gas absorption in a flow system.	1. Helium. British Oxygen Co. Ltd.			
	2. Water. No information given.			
	3. Acids. No information given.			
APPARATUS / PROCEDURE •	ESTIMATED ERROR:			
The previously degassed solvent flows	$5k_{s} = 0.010$			
in a thin film down an absorption spiral containing helium gas plus				
solvent vapor at a total pressure of l atm. The volume of gas absorbed is				
measured in attached calibrated	REFERENCES:			
burets (1).	<pre>REFERENCES: 1. Morrison, T.J.;Billett, F. J. Chem. Soc. 1952, 3819.</pre>			
burets (1).	<pre>REFERENCES: 1. Morrison, T.J.;Billett, F.     <u>J. Chem. Soc.</u> 1952, 3819.</pre>			
burets (1).	<pre>REFERENCES: 1. Morrison, T.J.;Billett, F. <u>J. Chem. Soc.</u> 1952, 3819.</pre>			

COMPONENTS:		ORIGINAL MEASUREMENTS:	· · · · · · · · · · · · · · · · · · ·	
		Akerlof, G.		
l. Helium; He; 7440-59-7				
2. Water; H <sub>2</sub> O; 7732-18-5				
3. Perchloric Acid: HClO4: 7601	-90-3	J. Am. Chem. Soc.	1935, <u>57</u> ,1196-1201.	
VARIABLES:		PREPARED BY:		
T/K: 298.15 P/kPa: 101.325 (1 atm)		T.D.Kittre	dge, H.L.Clever	
EXPERIMENTAL VALUES:				
T/K He Solubility mol	acid	k_s =	k <sub>sX</sub> =	
$\frac{dm^3 (STP)}{1.000 \text{ kg H}_{2}0} \qquad 1.000$	) kg H <sub>2</sub> 0	$(1/m) \log (S^{O}/S)$	$(1/m) \log (X^{O}/X)$	
		· · · · · · · · · · · · · · · · · · ·		
298.15 0.0086 0.	. 0	-	-	
0.0187 6.	. 89	-0.049	-0.034	
The paper is not clear as to w solution is for 1.000 kg of H effect parameter, k <sub>SX</sub> , was ca helium solubility was for salt	whether ,0 or fc [culated t soluti	the solubility of h or 1.000 kg of solut by the compiler as on containing 1.000	elium in the salt ion. The salt suming that the kg water.	
AL	JXILIARY	INFORMATION		
METHOD: Gas absorption. The heliu	ım was	SOURCE AND PURITY OF MA	ATERIALS:	
presaturated with water vapor, solvent salt concentration was mined by a density measurement the solvent volume was measure displacement of an equivalent of mercury. The gas-liquid int was gently stirred for two hou although equilibrium appeared established within a matter of utes.	, the s deter- c, and ed by volume cerface irs, to be min-	<ol> <li>Helium. Source stated to be 98 N<sub>2</sub> the impurity greatest amount</li> <li>Water. No infor</li> <li>Perchloric acid</li> </ol>	not given. Gas per cent He with present in the mation given. . No information.	
APPARATUS/PROCEDURE:		ESTIMATED ERROR: δπ/κ =	0.01	
		01/1		
		REFERENCES:		

COMPONENTS:	ORIGINAL MEASUREMENTS:		
	Morrison, T.J.; Johnstone, N.B.B.		
1. Helium; He; 7440-59-7			
2. Water; H <sub>2</sub> O; 7732-18-5	J Chem Soc 1955, 3655 - 3659		
3. Ammonium Type Salts	<u> </u>		
VADIADI EC.			
VARIABLES: T/K: 298.15	PREPARED BY:		
P/kPa: 101.325 (1 atm)	T.D.Kittredge, H.L.Clever		
EXPERIMENTAL VALUES:			
$T/K$ $k_s = (1/m) \log (S^O/S) k_{sX}$	$x = (1/m) \log (x^{o}/x)$		
Ammonium chloride ; NHAC1; 12125-	02-9		
298.15 0.027	0.042		
N, N, N-Trimethyl methanaminium i C <sub>4</sub> H <sub>l2</sub> NI; 75-58-1	odide (Tetramethyl ammonium iodide);		
298.15 -0.001	+0.014		
N, N, N-Triethyl ethanaminium brc C <sub>8</sub> H <sub>20</sub> NBr; 71-91-0	omide (Tetraethyl ammonium bromide);		
298.15 -0.024	-0.009		
value is given in the paper. The SO/S ratios are referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter k <sub>SX</sub> from the mole fraction solubility ratio X <sup>O</sup> /X. The salts were assumed to be 100 per cent ionized and cation and anion were summed together in the mole fraction calculation.			
AUXILIARY	INFORMATION		
METHOD:	SOURCE AND PURITY OF MATERIALS:		
Gas absorption in a flow system.	1. Helium. British Oxygen Co. Ltd.		
	2. Water. No information given.		
	3. Salts. No information given.		
APPARATUS/PROCEDURE:	$\boldsymbol{\delta} \mathbf{k}_{s} = 0.010$		
The previously degassed solvent flow	S		
in a thin film down an absorption			
solvent vapor at a total pressure	REFERENCES:		
absorbed is measured in attached	J. Chem. Soc. 1952, 3819.		
callbrated burets.(1).			

COMPONENTS:	ORIGINAL MEASUREMENTS:
l. Helium; He; 7440-59-7	Feillolay, A.;Lucas, M.
2. Water; H <sub>2</sub> O; 7732-18-5	
3. N,N,N-Tributyl-l-butanaminium Brom- ide (Tetrabutyl Ammonium Bromide); C <sub>16</sub> H <sub>36</sub> NBr 1643-19-2	<u>J</u> . <u>Phys</u> . <u>Chem</u> .1972, <u>76</u> , 3068 - 3072.
VARIABLES:	PREPARED BY:
T/K: 298.15 - 308.15	P.L.Long, H.L.Clever
Salt/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 4	
EXPERIMENTAL VALUES: Solubility T/K ml He (STP) kg <sup>-1</sup> H <sub>2</sub> O	Salt $k_s = (1/m) \log (S^{O}/S)$ mole kg <sup>-1</sup> H <sub>2</sub> O
298.15 8.52, 8.53, 8.54	0.0 -
8.77	0.264 -0.046
8.00	0.475 -0.040
8.90	0.496 -0.037
8.94	0.524 -0.039
8.94	0.545 -0.037
9 09	
9.09	0.831 -0.033
9.18	0.839 -0.038
9.08	0.853 -0.032
8.89	
9.08	1.644 -0.017
10.65	3.421 -0.028
11.07	3.454 -0.033
10.92	
308 15 8 35 8 34 8 30	0.0
8.89	0.522 -0.054
8.97	0.530 -0.061
9.13	0.820 -0.049
9.21	
11.70	3.460 -0.043
11.82	3.465 -0.044
12.70	4.030 -0.045
AUXILIARY	INFORMATION
	Helium Ilbir Tiguide Chated to
	be of 99.99 per cent purity.
	2. water. No information given.
	<ol> <li>N,N,N-Tributyl-l-butanaminium bromide. Southwestern Analytical Chemical. Polarographic grade, used as received.</li> </ol>
	ESTIMATED ERROR:
modeled after the apparatus is	6 s/s = 0.005
Hung (1). The procedure was the same as that used by Hung except that the	00/0 - 0.000
time allowed for equilibration is	REFERENCES:
liquid equilibration required about 16 hours.	1. Hung, J.H. 1968, Ph.D. thesis, Clark University, Worcester, MA.

COMPONENTS			OD T CTN AL WEACHDENENTC.	
COMPONENTS:			URIGINAL MEASUREMENTS:	
l. Helium; He;	7440-59-7		Mollison, 1.J.; Johnstone, N.B.B.	
2. Water; H <sub>2</sub> O;	7732-18-5			
3. Barium Chlor	ride: BaCl	.: 10361-37-2	<u>J. Chem. Soc.</u> 1955, 3655 - 3659.	
		2, 10001 0, 1		
VARIABLES:			PREPARED BY:	
<b>Т/К:</b> Д/КДЭ.	298.15	(1 a+m)		
r/kra.	101.323	(I acm)	T.D.Kittredge, H.L.Clever	
EXPERIMENTAL VALUE	S:			
_	Т/К	k <sub>s</sub> =	k <sub>sx</sub> =	
		(1/m) log (S <sup>O</sup> /S)	(1/m) log (X <sup>O</sup> /X)	
	298.15	0.086	0.109	
-	ho Sotsaho	now salt offor	t paramotor k was apparently	
determined from of helium in pu	ne setsche m only two ure water,	solubility me S <sup>O</sup> , and the s	t parameter, $k_s$ , was apparently assurements. They were the solubility solubility of helium in a near one which so The SO(s ratio was referenced	
to a solution of	containing	1.000 kg of w	ater. The compiler calculated the salt	
effect paramete	er, k <sub>sX</sub> .	-	_	
		AUXILIARY	INFORMATION	
METHOD:			SOURCE AND PURITY OF MATERIALS:	
Gas absorption	in a flow	augtom	1. Helium. British Oxygen Co. Ltd.	
Gas absorption	in a flow	system.	2. Water. No information given.	
			3. Barium chloride. No information	
			given.	
			given.	
1			given.	
			given.	
			given.	
APPARATUS/PROCEDUF	RE :		given. ESTIMATED ERROR:	
APPARATUS/PROCEDUF The previously	Æ: degassed	solvent flows	given. ESTIMATED ERROR: & k <sub>s</sub> = 0.010	
APPARATUS/PROCEDUR The previously in a thin film Spiral contains	RE: degassed down an a	solvent flows	given. ESTIMATED ERROR: $\mathbf{\delta}$ k <sub>s</sub> = 0.010	
APPARATUS/PROCEDUF The previously in a thin film spiral contain solvent vapor a	RE: degassed down an a ing helium at a total	solvent flows bsorption gas plus pressure of	given. ESTIMATED ERROR: $\delta$ k <sub>s</sub> = 0.010 REFERENCES:	
APPARATUS/PROCEDUF The previously in a thin film spiral containi solvent vapor a l atm. The volu measured in att	RE: degassed down an a ing helium at a total ume of gas	solvent flows bsorption gas plus pressure of absorbed is ibrated	given. ESTIMATED ERROR: $\delta k_s = 0.010$ REFERENCES: Morrison, T.J.; Billett, F	
APPARATUS/PROCEDUR The previously in a thin film spiral contains solvent vapor a l atm. The volu measured in att burets (1).	degassed down an a ing helium at a total ume of gas tached cal	solvent flows bsorption gas plus pressure of absorbed is ibrated	given. ESTIMATED ERROR: $\delta_{k_{s}} = 0.010$ REFERENCES: Morrison, T.J.; Billett, F. J. Chem. Soc. 1952, 3819.	
APPARATUS/PROCEDUF The previously in a thin film spiral containi solvent vapor a l atm. The volu measured in att burets (1).	RE: degassed down an a ing helium at a total ume of gas tached cal	solvent flows bsorption gas plus pressure of absorbed is ibrated	given. ESTIMATED ERROR: $\delta k_s = 0.010$ REFERENCES: Morrison, T.J.; Billett, F. J. Chem. Soc. 1952, 3819.	
APPARATUS/PROCEDUF The previously in a thin film spiral containi solvent vapor a l atm. The volu measured in att burets (1).	RE: degassed down an a ing helium at a total ume of gas tached cal	solvent flows bsorption gas plus pressure of absorbed is ibrated	given. ESTIMATED ERROR: $\delta k_s = 0.010$ REFERENCES: Morrison, T.J.; Billett, F. J. Chem. Soc. 1952, 3819.	

HN VOL 1-D

COMPONENTS:			ORIGINAL MEA	SUREMENTS:	
l. Helium; He; 7440-59-7		Shoor, S.K.;Walker, R.D.; Gubbins, K.E.			
2. Water	; H <sub>2</sub> O; 7732-18-5				
3. Potas: -3	sium Hydroxide; KOH;	1310-58	J. Phys.	<u>Chem</u> . 1969,	<u>73</u> , 312 - 317.
VARIABLES:	T/K: 298.15 - 353.15	;	PREPARED BY:	P.L.Long, H	.L.Clever
]	KOH/mol dm <sup>-3</sup> : 0 - 7	.60			
EXPERIMENTA	AL VALUES:			· · · ·	
т/к	Helium Solubility Mol Fraction x 106	Solubilit Ratio X <sup>O</sup> /	y Potassiu X Wt %	m Hydroxide mol dm <sup>-3</sup>	$k_s = \frac{\log (x^0/x)}{C}$
298.15	6.7	1.00 1.39 1.75 3.57 13.1	0.00 5.00 9.00 19.00 32.40	0.00 0.92 1.70 3.99 7.60	_ 0.155 0.143 0.139 0.147
313.15	6.7	1.00 1.36 1.73 3.71 12.7	0.00 5.00 9.00 19.00 32.40	0.00 0.92 1.70 3.99 7.60	- 0.145 0.140 0.142 0.145
333.15	7.2	1.00 1.39 1.96 3.59 13.0	0.00 5.00 9.00 19.00 32.40	0.00 0.92 1.70 3.99 7.60	- 0.155 0.172 0.139 0.147
353.15	8.0	1.00 1.44 1.89 3.77 13.7	0.00 5.00 9.00 19.00 32.40	0.00 0.92 1.70 3.99 7.60	- 0.172 0.163 0.144 0.150
The k <sub>s</sub> values were calculated by the c of 10 error in the original paper. The		compiler. T KOH molar	here appears ities are at	to be a factor 298.15 K.	
AUXILIARY INFORMATION					
METHOD: Ga:	s chromatograph (1)		SOURCE AND I 1. Helium purity	PURITY OF MATER n. Source not 99.99 per c	RIALS: given. Minimum eent.
			2. Water. glass-	Distilled a teflon still	nd degassed in
			3. Potass yzed r a maxi tions	ium hydroxid eagent grade mum of 1 % K protected fr	e. Baker Anal- which contained 2 <sup>CO</sup> 3. KOH solu- om atm CO2.
APPARATUS/	PROCEDURE:		ESTIMATED E	RROR: <sub>§</sub> T/K =	0.05
Gas chromatographic analysis, thermal conductivity detector, nitrogen carrier gas.The helium saturated		DEPENDINGE			
solution the gas then thro les were over a po mine equ from satu in gas-t	s were prepared by h through presaturator bugh the KOH solutic withdrawn from the eriod of 48 hours to ilibrium. Samples to urator to gas chroma ight Hamilton syring	oubbling s and on. Samp- solution o deter- cansfered atograph ges.	REFERENCES: Gubbins, R. D. J.	K.E.; Carden Gas Chromat	, S.N.; Walker, <u>og</u> . 1965, <u>3</u> , 98.

2017			····	······	
COMPONENTS:		ORIGINAL MEASUREMENTS:			
1. Helium; He; 744	0-59-7	Akerlof,	G.		
2. Water; H <sub>2</sub> O; 773	2-18-5				
3. Alkali Halides		<u>J. Am. Ch</u>	nem. Soc.	1935, <u>57</u> ,	1196-1201
VARIABLES:		PREPARED BY	:		
T/K: 298. P/kPa: 101.	15 325 (l atm)		T.D.Kitt	redge, H.	L.Clever
				··· .	
EXPERIMENTAL VALUES:	ility mol salt	(1/m)1	$\log(s^0/s)$	(1/m)1	$(x^{0}/x)$
$\frac{dm^3}{dm^3}$ (STP)	$\frac{1100}{1.000 \text{ kg H}_20}$	$\frac{(1)(1)}{(1)} = k$		(1) m/1	cy (n / n/
1.000 kg	<sup>H</sup> 2 <sup>O</sup> .		5		
Lithium Chlori	de; LiCl; 7447-41-8				
298.15 0.008 0.013	6 0.0 6 6.18	-0.	.032	-0.	017
Lithium Todido	• T.iT. 10377-51-3			5.	•
298.15 0.008	6 0.0				
0.010	9 2.40	-0.	.043	-0.	028
Sodium Chlorid	e; NaCl; 7647-14-5				
298.15 0.008	6 0.0	-	050		<b>C 7</b>
0.004	3 5.81	0.	.052	0.0	6/
Potassium Chlo	ride; KCl; 7447-40-7	7			
298.15 0.008	6 0.0 8 4.72	0.	.054	0.0	69
The paper is not c solutions is for l effect parameter, was for 1.000 kg H	lear as to whether t .000 kg of $H_2O$ or f $k_{gX}$ , was calculated $2^{O}$ .	the solubil for 1.000 k by the com	lity of he kg of solu mpiler,ass	elium in t ition. The suming the	he salt salt solubility
	AUXILIARY	INFORMATION			
METHOD: Gas absorpti	on. The helium was	SOURCE AND	PURITY OF M	ATERIALS:	· · · · · · · · · · · · · · · · · · ·
Presaturated with water vapor, the Solvent salt concentration was deter-		l. Helium cent H	m. Source He with Na	not given the impu	. 98 per ritv
mined by a density	measurement, and was measured by	presen	nt in the	greatest	amount.
displacement of an	equivalent volume	2. Water.	. No infor	mation give	ven.
was gently stirred	for two hours,	3. Alkali given.	i Halides. •	No inform	mation
although equilibri   <sup>est</sup> ablished within	um appeared to be a matter of min-				
utes.					
APPARATUS/PROCEDURE:	<u></u>	ESTIMATED E	ERROR: <b>8</b> T/F	< = 0.01	
		REFERENCES:	:		
ł					
1					

COMPONENTS :	ORIGINAL MEASUREMENTS:			
	Morrison, T.J.; Johnstone, N.B.B.			
1. Helium; He; 7440-59-7				
2. Water; H <sub>2</sub> O; 7732-18-5				
3. Alkali Halides	<u>J</u> . <u>Chem</u> . <u>Soc</u> . 1955, 3655 - 3659.			
VARIABLES:	PREPARED BY:			
T/K: 298.15 P/kPa: 101.325 (1 atm)	T.D.Kittredge			
EXPERIMENTAL VALUES:				
T/K $k_s = (1/m) \log (S^O/S) k_{sy} =$	= (l/m) log (X <sup>O</sup> /X)			
5				
298 15 0 050	0.065			
	0.005			
Sodium Chioride; NaCl; 7647-14-5	0.096			
	0.090			
Sodium Bromide; NaBr; 7647-15-6	0.100			
298.15 0.087	0.102			
Potassium Chloride; KCl; 7447-40-7				
298.15 0.068	0.083			
Potassium Iodide; KI; 7681-11-0				
298.15 0.083	0.098			
The values of the Setschenow salt effect parameters, $k_s$ , were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S <sup>O</sup> , and the solubility of helium in a near one equivalent of salt per kg of water solution, S. The S <sup>O</sup> /S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter $k_{SX}$ from the mole fraction solubility ratio X <sup>O</sup> /X.				
AUXILIARY	INFORMATION			
METHOD:	SOURCE AND PURITY OF MATERIALS:			
Gas absorption in a flow system.	l Helium British Oxygen Co Ltd			
	a main and family in			
	2. water. No information given.			
	<ol> <li>Alkali Halides. No information given.</li> </ol>			
	5			
	ESTIMATED ERROR:			
APPARATUS/PROCEDURE:	$\mathbf{S} k_{s} = 0.010$			
The previously degassed solvent flows in a thin film down an absorption				
spiral containing helium gas plus				
1 atm. The volume of gas absorbed is	REFERENCES;			
burets (1).	J. Chem. Soc. 1952, 3819.			
1				

COMPONENTS:	ORIGINAL MEASUREMENTS:						
<pre>1. Helium; He; 7440-59-7 2. Water: H.O: 7732-18-5</pre>	Mishnina, T.A.; Avdeeva, O.I.; Bozhovskaya, T.K.						
3. Sodium Chloride; NaCl; 7647-14-5	Materialy <u>Vses</u> . <u>Nauchn</u> . <u>Issled</u> . <u>Geol. Inst. 1961</u> , <u>46</u> , 93 - 110.						
VARIABLES: T/K: 278.15 - 318.15 NaCl/ g eq dm <sup>-3</sup> : 0 - 5.4 P/kPa: 101.325 (l atm)	PREPARED BY: A. L. Cramer						
EXPERIMENTAL VALUES:							
Bunsen Coeffic:	Lent, $\alpha \times 10^3$ Setschenow						
haci/g eq dm 3	Parameter,						
$ \underbrace{ \begin{array}{cccccccccccccccccccccccccccccccccc$	$3.0 \ 3.5 \ 4.0 \ 4.5 \ 5.0 \ 5.4 \ K_{\rm s}$						
278.15       9.4       8.6       7.9       7.3       6.7       6.2         283.15       9.1       8.3       7.6       7.0       6.4       5.9         288.15       8.8       8.0       7.4       6.8       6.2       5.7         293.15       8.6       7.9       7.2       6.6       6.0       5.5         298.15       8.5       7.8       7.1       6.5       5.9       5.4         303.15       8.4       7.7       6.9       6.4       5.8       5.3         308.15       8.4       7.6       6.9       6.3       5.8       5.2         313.15       8.4       7.6       6.9       6.3       5.7       5.2	$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
AUXILIARY	INFORMATION						
METHOD: The table of smoothed Bunsen coeffici- ents of helium dissolved in aqueous sodium chloride solutions was prepared by the authors from the data of Morrison and Johnstone (1) and of Cherepennikov (2). The secondary source of data is used because the original Cherepennikov solubility data was not available to the compiler.	SOURCE AND PURITY OF MATERIALS: No information given.						
APPARATUS/PROCEDURE:	ESTIMATED ERROR:						
	<pre>REFERENCES: 1. Morrison, T.J.; Johnstone, N.B. J. Chem. Soc. 1954, 3441. 2. Cherepennikov, A.A. Coll. Reports of the Sci. Conf. 1958, LICI, L.</pre>						

COMPONENTS :	ORTGINAL MEASUREMENTS:					
l. Helium; He; 7440-59-7	Morrison, T.J.; Johnstone, N.B.B.					
2. Water; H <sub>2</sub> O; 7732-18-5						
3. Sodium Sulfate; Na <sub>2</sub> SO <sub>4</sub> ; 7757-82-6	<u>J. Chem</u> . <u>Soc</u> . 1955, 3655 - 3659					
VARIABLES:	PREPARED BY:					
T/K: 298.15 P/kPa: 101.325 (1 atm)	T.D.Kittredge, H.L.Clever					
EXPERIMENTAL VALUES:						
$T/K$ $k_s =$	k <sub>sX</sub> =					
(1/m) log (S <sup>O</sup> /S)	(1/m) log (X <sup>O</sup> /X)					
298.15 0.118	0.141					
determined from only two solubility measurements. They were the solubility of helium in pure water, S <sup>o</sup> , and the solubility of helium in a near one eq- uivalent of salt per 1.000 kg of water solution, S. The S <sup>o</sup> /S ratio was ref- erenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter, k <sub>SX</sub> .						
AUXILIARY	INFORMATION					
METHOD:	SOURCE AND PURITY OF MATERIALS:					
Gas absorption in a flow system.	1. Helium. British Oxygen Co., Ltd.					
	2. Water. No information given.					
	3. Sodium Sulfate. No information given					
	ESTIMATED ERROR:					
APPARATUS/PROCEDURE:						
The previously degassed solvent flows in a thin film down an absorption spiral containing helium gas plus	$\delta k_{\rm S} = 0.010$					
solvent vapor at a total pressure of l atm. The volume of gas absorbed is measured in attached calibrated burets (1).	REFERENCES: 1. Morrison, T.J.; Billett, F. <u>J. Chem. Soc</u> . 1952, 3819.					

COMPONENTS :	ORIGINAL MEASUREMENTS:
	Akerlof, G.
1. Helium; He; 7440-59-7	
2. Water; H <sub>2</sub> O; 7732-18-5	
3. Sodium Nitrate; NaNO <sub>3</sub> ;7631-99-4	<u>J. Am. Chem. Soc.</u> 1935, <u>57</u> ,1196-1201.
5	
VARIABLES:	PREPARED BY:
T/K: 298.15 P/kPa: 101.325 (1 atm)	T.D.Kittredge, H.L.Clever
EXPERIMENTAL VALUES:	14 k - k -
$\frac{dm^3 (STP) He}{dm^3 (STP) He}$	$\frac{1t}{H_2O}$ $k_s = k_{sX}$
1.000 kg H <sub>2</sub> 0	$(1/m) \log (S^{O}/S) $ $(1/m) \log (X^{O}/X)$
0.0039 6.95	0.049 0.064
The paper is not clear as to whet	her the solubility of helium in the salt
solution is for 1.000 kg of H <sub>2</sub> O	or for 1.000 kg solution. The salt effect
solubility was for salt solution	containing 1.000 kg H <sub>2</sub> O.
	_
L	
AUXIL	IARY INFORMATION
METHOD: Gas absorption. The helium w	as SOURCE AND PURITY OF MATERIALS:
presaturated with water vapor, th	e 1. Helium. Source not given. Gas
mined by a density measurement, a	nd $N_2$ the impurity present in the
the solvent volume was measured b displacement of an equivalent vol	y greatest amount.
of mercury. The gas-liquid interf	ace 2. Water. No information given.
although equilibrium appeared to	be 3. Sodium Nitrate. No information.
established within a matter of mi	n-
APPARATUS/PROCEDURE:	8 T/K = 0.01
	REFERENCES:

COMPONENTS :				ORIGINAL MEASUREMENTS:				
l. Helium; He; 7440-59-7				Clever, H.L.;Reddy, G.S.				
2. Metha	nol; CH <sub>4</sub> O; 67	-56-1						
3. Sodiur	m Iodide; NaI		J. Chem.	Eng. Da	<u>ata</u> 1963, <u>9</u>	<u>8</u> , 191 -	192.	
VARIABLES:	T/K: 303.15		PREPARED B	Y:				
1	NaI/mol dm <sup>-3</sup> :	0 - 3.53			S.A.Jol	nnson		
Total 1	P/kPa: 101.3	25 (l atm)	1					[
EXPERIMENTA	AL VALUES:							
т/к	Ostwald Coefficient	Solubility Ratio S <sup>O</sup> /S	Sodi Iodi	um .de	Salt Ef	fect Para	neters	
	L x 10 <sup>2</sup>		mol	dm-3	<sup>k</sup> sC	<sup>k</sup> sm	k <sub>sX</sub>	1
303.15	3.75 (S <sup>O</sup> ) 3.52	1.0	0.	.0	0.254	0,198	0.116	
	2.92	1.285	0.	419				
	1.46 1.10	2.225 2.560 3.395	2.	31 82	(Values	s at infin:	ite dilu	tion
	0.90	4.165	3.	.53				
The sal	t effect para	meters are:	k <sub>sC</sub> =	= (1/C)log	g(s <sup>o</sup> /s)			
			k <sub>sm</sub> =	= (1/m)log	g(s <sup>o</sup> /s)			
			k <sub>sX</sub> =	= (1/m)log	g (x°/x)			
where c concent: of solul assuming	is the NaI c ration in mol bility ratio, 100 per cent	concentration kg <sup>-1</sup> of met and X <sup>O</sup> /X is dissociatio	n in m thanol s the on of	nol dm <sup>-3</sup> d L, S <sup>O</sup> /S is mol fract the NaI.	of solution the Ost tion solution	ion, m is t twald coef: ubility ra	the NaI ficient tio	
The den is:	sity of the m	e/g cm <sup>-3</sup>	= 0.7	781 + 0.12	a funct. 29 C	ION OF NAL	MOIATIL	Ŷ
		AUXI	<b>LIARY</b>	INFORMATION	N			
METHOD:				SOURCE AND	PURITY O	F MATERIALS;		
				<ol> <li>Helium. Matheson Co., Inc. Reg- ular grade, stated to be 99.99 per cent pure.</li> </ol>				
				2. Methanol. Merck Anhydrous.				
				<ol> <li>Sodium Iodide. Baker, Analyzed Reagent Grade.</li> </ol>				
		ESTIMATED	ERROR:					
APPARATUS/	PROCEDURE: The after that of	apparatus wa Markham and	as 1					Į
Kobe (1)	. A length of	TRUEBORE to	ub-					ĺ
used as	the gas buret	. The volume	e of	REFERENCES	5:			
vapor, t	aken up by 10	)3.1 cm <sup>3</sup> of	C	1. Markl	ham, A.E	.;Kobe, K.	A.	
SOLUTION	was measured	1.			<u>. cnem</u> .	<u>300</u> . 1941	, <u>03</u> , 44	ז.

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COMPONENTS :			ORIG	INAL MEASUREMENTS:	
l. Helium; He;	7440-59-7		Cargill, R.W.		
<pre>2. Ethanol (Ethyl Alcohol); C<sub>2</sub>H<sub>6</sub>O; 64-17-5</pre>			J. 0 1978	<u>Chem. Soc., Faraday</u> <u>Trans. 1</u> . 3, <u>74</u> , 1444 - 1456.	
3. Water; H <sub>2</sub> O;	7732-18-5				
VARIABLES:			PREP	ARED BY.	
HO P/kPa:	7.35 - 33	5.15		P. L. Long	
Ethanol/X2	: 0.0 - 0	.982		1.1011A	
EXPERIMENTAL VALUES	:				
Ethanol Mol Fraction	т/к	10 <sup>4</sup> T <sup>-1</sup> log(	S/cm <sup>3</sup>	$^{3}$ kg <sup>-1</sup> ) S/cm <sup>3</sup> kg <sup>-1</sup>	
0.00*	278.35	35.93	0.970	9.33	
	284.05	35.21	0.961	9.14	
	294.45	33.97	0.930	8.51	
0.008	332.35	30.09	0.953	8.97	
0.000	277.35	35.88	0.976	9.40 3 9.29	
	285.45	35.04	0.954	8.99	
	294.15	34.00	0.945	8.81	
	303.95	32.90	0.936	8.63	
	314.25	31.83	0.937	8.65	
	324.55	30.81	0.955	9.10	
0.021	277.85	36.00	0.904	9.20	
	285.25	35.07	0.954	8.99	
	294.25	33.99	0.950	8.91	
	313.15	31.94	0.941	8.73	
	322.95	30.95	0.961	9.14	
0.048	277.35	36.06	0.975	9.53	
0.040	285.75	35.01	0.958	9.08	
	295.35	33.87	0.947	8.85	
	303.75	32.93	0.953	8.97	
	314.25	31.83	0.952	2 8.95	
	323.85	29.90	0.971	L 9.35	
*Values in wate	r. For ot	her helium +	water	solubility values from the same	
laboratory see	referenc	e 3 data shee	t.	_	
	· · · · · ·	AUXILIARY	INFO	RMATION	
METHOD: Absorptio	n of gas	by a thin	SOUR	CE AND PURITY OF MATERIALS:	
film of liquid Morrison and E	Modific	ation of the thod. Modifi-	1.	Helium.	
cations includ with a constant	le replaci	.ng Valve A mp (Watson-	2.	Ethanol.	
Marlow MHRE/22	, with Ne	oprene tub-	3.	Water.	
ing), and meas	suring the	mass of the			
(instead of +b	iy the abs	on a top-			
pan balance (1	.). The s	solubility.S	. l		
is reported as	cm <sup>3</sup> He,a	at 273.15 K			
and 101.325 kF	a,absorbe	ed in 1.000 kg	3		
solvent.					
				IMATED ERROR:	
APPAKATUS/PROCEDUR	⊡: Modific	cation of the			
solvent is dec	assed us	ing the vapor	_		
pump principle	e (1). Ea	ach determina	-		
tion contains	about 20	) cm <sup>3</sup> of gas	DEP	EDENCES .	
in up to 500 c	m <sup>J</sup> of sol	lvent, which	1.	Morrison, T. J.: Billett, F.	
is then recyc	cled. The	e density of	1	J. Chem. Soc. 1948, 2033;	
run. so that t	the evact	composition		<u>Ibid.195</u> 2, 3819.	
of the solution	on can h	be determined	2.	International Critical Tables	
(2).				1928, <u>III</u> , 116-119.	
			3.	Morrison, T. J.; Johnstone, N. B.	
1			1	J. Chem. Soc. 1954, 3441.	

COMPO	MPONENTS:							
1.	Helium; He	; 7440-59	-7		Cargill, R. W			
2.	Ethanol; (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O 64-17-5			J. <u>Chem</u> . 1978, <u>74</u> ,	<u>Soc., Faraday</u> 1444 - 1456.	Trans.	<u>1</u> .	
3.	Water; H <sub>2</sub> O	; 7732-18	-5					
		<u></u>			<u></u> ,			
Etl	hanol				2 <b>-</b> 1	<u> </u>		
Mol	l Fraction	<u>T/K</u>	$10^{4} T^{-1}$	<u>log (S</u>	/cm <sup>3</sup> kg 1)	S/cm <sup>3</sup> kg <sup>-1</sup>		
	0.075	281.55	35.53	0	.951	8.93		
		285.45	33.04	0	.940	8./1		
		313.65	31.89	0	.969	9.31		
		329.85	30.31	ĩ	.001	10.0		
	0.099	277.85	36.00	0	.927	8.45		
		285.35	35.05	0	.926	8.43		
		294.15	34.00	0	.936	8.63		
		304.05	32.89	0	.945	8.81		
		312.55	32.00	U 1	.963	9.18		ć
		333 45	29 99	1	049	11 2		
	0.180	279.05	35.84	0	.936	8.63		
		289.25	34.58	Ő	.967	9.27		
		298.85	33.47	0	.986	9.68		
		309.75	32.29	1	.039	10.9		
		321.15	31.24	1	.105	12.7		
	0 216	278 35	35.93	<u> </u>	. 100	8.65		
	0.210	286.55	34.91	Ő	.962	9.16		
		295.85	33.81	1	.007	10.2		
		304.65	32.83	1	.039	10.9		
		315.35	31.72	1	.117	13.1		
		324.65	30.80	1	.145	14.0		
	0 312	279 05	35 84	<u> </u>	. 227	10.1		
	0.512	289.45	34.55	ī	.075	11.9		
		298.75	33.48	1	.123	13.3		ļ
		309.75	32.29	1	.176	15.0		
		321.85	31.07	1	. 266	18.5		
	0.410	278.35	35.95	1	.111	12.9		
	0.110	286.65	34.90	ī	.131	13.5		
		295.65	33.83	1	.204	16.0		
		305.15	32.78	1	.248	17.7		
		314.95	31.76	1	.310	20.4		
		324.65 335 15	30.80 29 9/	1	. 340	21.9 27 Q		
	0.585	278.55	35.90	1	. 254	17.9		
		288.75	34.64	ī	.290	19.5		
		297.65	33.60	1	.337	21.7		
		310.85	32.18	1	.411	25.8		
	0 677	321.25	31.13	<u> </u>	•455 320	28.5		
	0.077	288.75	34.80	1	.363	23.1		
		299.05	33.44	ī	.408	25.6		
		309.65	32.30	1.	.462	29.0		
		320.55	31.20	1.	.516	32.8		
	0 995	332.65	30.07	1	.005	40.3		
	0.000	294.85	33.90	1	• 434 • 513	27.0		
		314.25	31.83	1	.602	40.0		
		328.75	30.42	ī	.652	44.9		
	0.982	278.85	35.87	1	. 484	30.5		
		289.15	34.59	1	.541	34.8		
		299.15	33.43	1	• 584 642	38.4 13 0		
		320.15	31.24	1	.042 .702	43.9 50.4		
		333.15	30.02	1	.789	61.5		
		· · · · · · · · · · · · · · · · · · ·						
					······································			

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COMPONENTS:			ORIGINAL MEASUREMENTS:			
l. Helium; He	; 7440-59-	7	R. W. Cargill			
<pre>2. 2-Methyl-2-propanol (t-Butanol); C4H100; 75-65-0</pre>			J. <u>Chem.</u> <u>Soc.</u> , <u>Faraday</u> <u>Trans</u> . <u>1</u> . 1978, <u>74</u> , 1444 - 1456.			
3. Water; H <sub>2</sub> O; 7732-18-5						
VARIABLES:	······································		PREP	ARED BY:		
T/K: 2 Mole Fract	277.45 - 3 tions (x):	34.25 0.00 - 0.854		P. L. Long		
EXPERIMENTAL VALUE	S:		I			
t-Butanol	m / v	$10^{4}m^{-1}$ $10\pi^{-1}$	c / am	$3 ka^{-1}$ $s (am^3 ka^{-1})$		
MOL Fraction	278 35	<u>10 1 109 (</u>		$\frac{Kg}{9}$ $\frac{372m}{9}$		
0.00*	284.05	35.21	0.96	1 9.14		
[	294.45	33.97	0.93	0 8.51		
	332.35	30.09	0.95	3 8.97		
0.006	277.75	36.01	0.98	4 9.64		
	286.05	34.97	0.96			
	293.75	34.05	0.94	o o.o.o.o.o.o.o.o.o.o.o.o.o.o.o.o.o.o.o		
	314.35	31.82	0.95	2 8.95		
	323.55	30.91	0.95	2 8.95		
	333.45	29.99	0.96	3 9.18		
0.011	277.85	36.00	0.97	9 9.53		
	285.15	35.08	0.96	0 9.12		
	294.75	33.93	0.94	2 8.75		
	313.15	31.94	0.94	1 8.73		
	324.05	30.86	0.95	4 8.99		
	333.85	29.97	0.96	7 9.27		
0.029	278.25	35.94	0.94	4 8.79		
	285.75	35.01	0.93	0 8.51		
	294.05	32.99	0.93	6 8.83		
	318.95	31.36	0.97	0 9.33		
0.046	277.45	36.05	0.90	7 8.07 7 8.07		
*Values in wate	er. For o	ther helium +	wat	er solubility values from the same		
laboratory see	e referenc	e 3 data shee	t.	-		
		AUXILIARY	INFO	RMATION		
METHOD: Absorptio	on of gas	by a thin	SOUR	CE AND PURITY OF MATERIALS:		
film of liquid	. Modific	ation of the				
Morrison and B cations include	illett met e replacin	hod. Modifi- g Valve A	1.	Helium.		
with a constant Marlow MHPE/22	t-flow pum	p (Watson-	2. <u>t</u> -Butanol.			
ing), and measured	uring the	mass of the	3.	Water.		
solvent leaving	g the abso	rption tube				
balance (1).	The solubi	lity. S.				
is reported as	cm <sup>3</sup> He at	273.15 K and				
101.325 kPa ab	sorbed in	1.000 kg	ļ			
solvent.						
			ESTI	MATED ERROR:		
APPARATUS/PROCEDUR	E: Modifie	d Morrison				
and Billet app	aratus. T	ne solvent	1			
principle (1)	Each det	ermination	1			
Contained about	t 20 cm <sup>3</sup> o	f gas in up				
to 500 cm <sup>3</sup> of	solvent, w	hich was then		Morrison, T. J. Billett, F. J.		
recycled. The	density o	f the solu-	1	Chem. Soc. 1948, 2033.		
that the exact	eu arter e	ach run, so	1	ibid. 1952, 3819.		
Solution could	be determ	ined (2).	2	International Critical Mables		
			<b> </b>	1928, III, 113.		
	_		3.	Morrison, T. J.; Johnstone, N. B. J. <u>Chem. Soc</u> . 1954, 3441.		

COMPONENTS:						
1.	1. Helium; He; 7440-59-7			R. W. Cargill		
2.	<pre>2. 2-Methyl-2-propanol (<u>t</u>-Butanol); C<sub>4</sub>H<sub>10</sub>O; 75-65-0</pre>			J. <u>Chem</u> . <u>Soc</u> 1978, <u>74</u> , 14	2., <u>Faraday</u> 444 - 1456.	<u>Trans. 1</u> .
3.	Water; H <sub>2</sub> O;	7732-18-	5			
_						
t. Mo	-Butanol ol Fraction	Т/К	$10^{4} \mathrm{T}^{-1}$ log (s	5/cm <sup>3</sup> kg <sup>-1</sup> )	<u>S/cm<sup>3</sup> kg-1</u>	
	0.046	285.15	35.08 0	.906	8.05	
		294.85	33.92 (	.921	8.34	
		304.15	32.88 0	.931	8.53	
		313.85	31.87 (	.981	9.57	
		324.05	30.86	L.009	10.2	
		333.35	30.00	L.047	11.1	
	0.072	278.15	35.96 (	.928	8.47	
		286.65	34.90 (	0.933	8.57	
		296.75	33.70 (	.960	9.12	
		306.05	32.68 (	0.984	9.64	
		320.65	31.19	1.045	11.1	
	0.100	331.65	30.16	1.106	12.8	
	0.102	282.15	35.45		9.55	
		299.55	22.20		10.4	
		300.13	21 /2	005	10.0	
		332 75	30 06 1	1 170	14 8	
	0.144	277.95	35.98 (	0.987	9,71	
	0.111	286.85	34.87	1.039	10.9	
		299.45	33.40	L.094	12.4	
		307.45	32.53	L.142	13.9	
		322.05	31.06	L.201	15.9	
		333.85	29.96	L.245	17.6	
	0.314	278.05	35.97	L.215	16.4	
		287.25	34.82	1.261	18.2	
		296.55	33.72	L.300	20.0	
		308.35	32.44	L.359	22.9	
		321.75	31.08	1.413	25.9	
		333.85	29.96	1.485	30.5	
	0.530	277.45	36.05	1.351	22.4	~
		287.25	34.82	L.399	25.1	
		297.15	33.66	L.449	28.1	
		308.65	32.41	L.497	31.4	
		320.00	31.19	L. 559	30.2	
	0 714	270 15	35.83	132	27 0	
	0.714	279.15	35 77 1	136	27.0	
		289.15	34.59	. 494	31.2	
		289.75	34.52	. 479	30.1	
		303.15	33.01	.546	35.2	
		319.45	31.30	.653	45.0	
	0.854	281.35	35.55 1	.487	30.7	
		289.15	34.59 1	.532	34.0	
		298.55	33.50 ]	.585	38.5	
		320.25	31.23	.703	50.5	

COMPONENTS:			ORIGINAL MEASUR	EMENTS:	
l. Helium; He: 7	440-59-7		Friedman, H.	•ط	
2 Waters V.O. 7	700 10 5				
2. water; H <sub>2</sub> 0; /	/32-18-5				
3. Nitromethane;	CH3NO2;	75-52-5	J. Am. Chem.	<u>Soc</u> . 1954, <u>76</u> , 3294-3297.	
VARIABLES:			PREPARED BY:		
P/kPa: 93	98.00 .326 (70	0 mmHg)	P	. L. Long	
EXPERIMENTAL VALUES:					
	т/к	Mol Fraction	Bunsen	Ostwald	
		$x_{1} \times 10^{4}$	Coefficient	Coefficient L x 10 <sup>2</sup>	
	Water				
	298.00			0.91	
				0.93	
		0.0687	0.85	0.93 av.	
	Water s	aturated with	nitromethane	(about 4 mol percent) (2)	
	298.00	acaracca with	ni ci ome chane	0.89	
				0.84	
			0.81	0.92 0.88 av.	
	Nitzana	thoma actumpta	d with water	(about 12 mol normant) (2)	
	200 00	thane saturate	a with water	(about 12 mor percent) (2)	
	290.00			1.63	
			1.53	1.67 av.	
The author repor Bunsen coefficie were calculated and that Henry's The Ostwald coef	ted Ostw nt and t by the c law is ficient	ald coefficier he mole fracti ompiler with t obeyed. in dry nitrome	its measured a on solubility the assumption ethane is 1.75	t about 700 mmHg. The at 101.325 kPa (1 atm) s that the gas is ideal, $\times 10^{-2}$ .	
		AUXILIARY	INFORMATION		
METHOD: Gas absor	ption. T emplove	he method was d by Eucken	SOURCE AND PURI	TY OF MATERIALS: ir Reduction Co. Reagent	
and Herzberg (1) included a magne	. Modifi tic stir	cations ring device	grade, 99.8 per cent pure by mass spectroscopy.		
instead of shakin vessel, and bala	ng the s ncing th	aturation e gas pressure	2. Water. Conductivity water.		
against a column	of merc	ury with	3. Nitromethane. Source not given.		
balancing the gas	cts inst s pressu	ead of re against the	Distilled	•	
~ CWODDUCT G .					
APPARATUS/PROCEDURE	The sol	vent was de-	ESTIMATED ERROF	$\delta T/K = 0.05$	
gassed by vacuum	. The pr	ocedure, re-		$\delta P/mmHg = 0.3$	
5 - 15 s evacuat	ion and	rapid stirring	r	0.03	
to produce cavita	ation. I gas. pre	n the solubil- saturated with	REFERENCES:		
solvent vapor, was brought into con-			1.Euken, A.;	Herzberg, G.	
tact with about the saturation ve	80 ml of essel. I	solvent in nitial con-	Z. Phys. C	<u>nem</u> . 1950, <u>195</u> , 1.	
ditions were esta	ablished	by a time ex-	2. Corelli,	R. M.	
was approached f	rom both	under- and	Chem. Abs	tr. 1952, <u>46</u> , 3370e.	
supersaturation by varying the rate.					

COMPONENTS:	ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7	Makranczy, J.; Megyery-Balog, K.;			
2 Pentane: C-Hie: 109-66-0	Rusz, L.; Patyi, L.			
$2.$ rentane, $c_{5n12}$ , $109-00-0$				
	<u>Hung. J. Ind. Chem. 1976, 4</u> , 269-280.			
VARIABLES:	PREPARED BY:			
P/kPa: 101.325 (1 atm)	S. A. Johnson			
EXPERIMENTAL VALUES:				
T/K Mol Fraction	Bunsen Ostwald oefficient Coefficient			
x <sub>1</sub> x 10 <sup>4</sup>	$\alpha \times 10^2$ L $\times 10^2$			
298.15 2.6	5.0 5.5			
The mole fraction and Bunsen coeffici	ent were calculated by the compiler.			
	ΙΝΕΟΡΜΑΤΙΟΝ			
METHOD.	CONDER AND DUDITY OF MATERIALS.			
	Source and Furth of Materials;			
Bodor, Bor, Mohai, and Sipos (1) was	grade reagents of Hungarian or			
used.	foreign origin. No further infor-			
	Mation.			
APPARATUS / PROCEDURE •	ESTIMATED ERROR:			
AFFARATUS/FROCEDURE:	$\delta x_{1}/x_{1} = 0.03$			
	REFERENCES :			
	1. Bodor, E.; Bor, Gv.: Mohai, B.			
	,,,,,,,, _			
	Sipos, G.			
	Sipos, G. <u>Veszpremi Vegyip. Egy</u> . <u>Kozl</u> . 1957. 1. 55:			
	Sipos, G. Veszpremi Vegyip. Egy. Kozl. 1957, 1, 55; Chem. Abstr. 1961, <u>55</u> , 3175h.			

COMPONENTS:	ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7	Clever, H.L.; Battino, R.; Saylor, J.H Gross, P.M.			
2. Hexane; C <sub>6</sub> H <sub>14</sub> ; 110-54-3				
0 14	J.Phys.Chem. 1957. 61. 1078-1083.			
	<u></u> , <u></u> , <u></u> , <u></u> , <u></u> ,			
VARIABLES:	PREPARED BY:			
T/K 288.15 - 314.95	P.L.Long			
P/kPa: 101.325 (1 atm)				
EXPERIMENTAL VALUES:				
T/K Mol Fraction Bunsen	Ostwald			
$x_1 \times 10^4$ $\propto \times 10^2$	$L \times 10^2$			
· · ·				
288.15 2.35 4.06	4.28			
298.45 2.57 4.38	4.79			
314.95 3.11 5.18	5.97			
Smoothed Data $AC^{0}/I = -Pmin$	v 9011 0 + 41 756 m			
Std Dev $AG^0 = 34.3$	$x_1 = 8011.0 + 41.750 1$			
$\Delta H^{O}/J \text{ mol}^{-1} = 8011.0$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -41.756$			
	10 <sup>0</sup> (I mol <sup>-</sup> I			
$X_1 \times 10^4$	$\Delta G^{2}/J$ mol -			
288.15 2.33	20,043			
	20,252 20,461			
303.15 2.74	20,669			
308.15 2.89 313.15 3.04	20,878 21,087			
There is a report of the partial mola	l volume of helium in hexane by			
dilatometry at 298.15 K of 42.3 $\pm$ 1 c	$m = m \circ 1 - (3)$ .			
The Bunsen coefficients were calculate	ed by the compiler.			
AUXILIARY	INFORMATION			
METHOD:	SOURCE AND PURITY OF MATERIALS:			
saturated with gas as it flows	1. Helium, Matheson Co., Both standard			
through an 8 mm x 180 cm glass	and research grade used.			
pressure is maintained at 1 atm as	2. Hexane. Humphrey-Wilkinson, Inc.,			
the gas is absorbed.	washed, dried over sodium, dis-			
ADDED NOTE.Makranczy, J.; Megyery-	tilled.			
<u>Ind. Chem. 1976, 4, 269 report an</u>				
Ostwald coefficient of 0.044 at 298.1				
used in the smoothed data fit above.				
APPARATUS/PROCEDURE: The apparatus is a	ESTIMATED ERROR:			
modification of that of Morrison and	$\delta$ T/K = 0.05			
Billett (1). The modifications in-	$\delta P/torr = 3$			
age for the solvent, a manometer for	$\frac{\delta X_1 / X_1}{REFERENCES: 1} = 0.03$			
constant reference pressure, and an extra buret for highly soluble gases.	J.Chem.Soc. 1948,2033; ibid. 1952, 3819.			
The solvent is degassed by a modi-	2. Baldwin, R.R.;Daniel, S.G.			
and Daniel (2).	J. <u>Appl</u> . <u>Chem</u> . 1952, <u>2</u> , 161.			
	3. Ng, W.Y.;Walkley, J. J. Phys. Chem. 1969, <u>73</u> , 2274.			

COMPONENTS :			ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7			Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M.			
2. Heptane; C <sub>7</sub> 1	H <sub>16</sub> ; 142-82-1	5				
			J. Phys. Chem.	1957, <u>61</u> , 1078 -1083.		
VARIABLES:		-	PREPARED BY:			
P/kPa:	101.325 (1 a)	atm)	ىلە ۲	ong		
	· · · · · · · · · · · · · · · · · · ·					
EXPERIMENTAL VALUE	S: T/K	Mol Fractic	on Bunsen Coefficient	Ostwald Coefficient		
	288.15	$\frac{x_1 \times 10}{2.24}$	$\frac{4}{3.46}$	<u> </u>		
	298.15	2.49	3.78	4.13		
	314.95	2.95	4.40	5.07		
Smoothed Data.	▲G <sup>O</sup> /J mol <sup>-</sup>	$l = -RT \ln X$	$x_1 = 7766.6 + 42.$	929 T		
	Std. Dev. C	$G^{O} = 3.8,$	Coef. Corr. 0.9	999		
	AHO/J mol <sup></sup>	= 7766.6,	$\Delta S^{O}/J K^{-1} mol^{-1}$	= -42.929		
	Т/К Мо	ol Fraction $X_1 \times 10^4$	▲G <sup>O</sup> /J mol <sup>-1</sup>			
	288.15	2.24	20,136			
	298.15	2.49	20,566			
	303.15	2.63	20,780			
	308.15	2.76	20,995			
is 37.5 ± 0.3 d tentative recor The Bunsen coe	cm <sup>3</sup> mol <sup>-1</sup> (4) nmended value fficients we	).The value e. re calculate	by dilatometry a ed by the compile	t l atm (3) is the er.		
		AUXILIARY	INFORMATION			
METHOD: Volumete	eric. The sol	lvent is	SOURCEAND PURITY (	OF MATERIALS:		
saturated with through an 8 mm spiral attached	gas as it finned for the second secon	lows Lass iret. The	<ol> <li>Helium. Matheson Co. Both standard and research grades were used.</li> </ol>			
pressure is main pressure of 1 a absorbed.	atm as the ga	a total as is	2. Heptane. Phillips Petroleum Co., Bartlesville, OK, pure grade, used			
ADDED NOTE.Makranczy, J.;Megyery- Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J. Ind. <u>Chem</u> . 1976, 4, 269 report an Ostwald coefficient of 0.044 at 298.15 K for this system. The value was not used in the smoothed data fit above.						
APPARATUS / PROCEDU	E: The appar	atus is a	ESTIMATED ERROR:	/K = 0.05		
modification of	that of Mon	rison and	<b>8</b> P	/torr = 3		
clude the addit	ion of a spi	iral stor-	δx	$x_1/x_1 = 0.03$		
age for the sol	lvent, a mano	ometer for	REFERENCES: 1. Mor	rison_T.J. Billett.F.		
extra buret for The solvent is fication of the and Daniel (2).	highly solu degassed by method of I	and an able gases. a modi- Baldwin	J. <u>Chem. Soc</u> . 1948 Z. <u>Baldwin</u> , R.R. J. <u>Appl. Chem</u> 3. Ng, W.Y.; Walk	,2033; <u>ibid.</u> 1952, 3819. ;Daniel, S.G. 1. 1952, 2, 161. ley, J.		
			4. Popov, G.A.;D Zh. Fiz. Khim	rakin, S.I. 1974, <u>48</u> , 631.		

COMPONENTS:	EVALUATOR:
<ol> <li>Helium; He; 7440-59-7</li> <li>Octane; C<sub>8</sub>H<sub>18</sub>; 111-65-9</li> </ol>	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 U.S.A. USA
	April 1978

CRITICAL EVALUATION:

The solubility of helium in octane was measured by Clever, Battino, Saylor, and Gross (1), by Makranczy, Megyery-Balog, Rusz, and Patyi (2), and by Wilcock, Battino, and Danforth (3).

The value of Makranczy, et al. (Ostwald coefficient 0.037, mole fraction  $2.5 \times 10^{-4}$  at 298.15 K) is not recommended. It was reported to only two significant figures and it is 3-5 percent higher than the smoothed data value at 298.15 K from the other two laboratories.

The smoothed data of Clever et al. ranges from 4.7 percent higher at 288.15 to 2.1 percent higher at  $3\overline{13.15}$  K than the smoothed data of Wilcock Although the two data sets agree within experimental error, the more <u>et</u> al. recent data of Wilcock <u>et al</u>. were determined with a better degassing proce-dure and with better control of temperature and pressure than used in the earlier work. Thus the two data sets were combined by the method of least squares to a Gibbs energy equation linear in temperature with a weight of 2 for the Wilcock  $\underline{\text{et}}$  al. data and a weight of 1 for the Clever et al. data.

The recommended values for the transfer of one mole of helium from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_{1} = 8486.3 + 40.965 T$ 

Std. Dev. △G° = 49, Coef. Corr. = 0.9954

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 8486.3, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -40.965$ 

The recommended solubility values and Gibbs energy as a function of temperature are in Table 1.

The solubility of helium in octane. The mole fraction solubility TABLE 1. at 101.325 kPa and the Gibbs energy as a function of temperature.

т/к	Mol Fraction $X_1 \times 10^4$	∆G°/J mol <sup>-1</sup>
283.15	1.971	20,085
288.15	2.098	20,290
293.15	2.229	20,495
298.15	2.363	20,700
303.15	2.500	20,905
308.15	2.641	21,110
313.15	2.784	21,314
318.15	2,930	21,519

Ng and Walkley (4) report a partial molal volume of helium in octane by dilatometry of 47.8  $\pm$  1 cm  $^3$  mol  $^{-1}$  at 298.15 K.

- Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1. 1957, <u>61</u>, 1078.
- Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. 2. Chem. 1976, 4, 269. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. Chem.
- з. <u>Thermodyn. 1978, 10, 817.</u> Ng, W. Y.; Walkley, J. <u>J. Phys. Chem</u>. 1969, <u>73</u>, 2274.

4.

COMPONENTS .			0.0.7		100.	
COMPONENTS:			ORIC	JINAL MEASUREMEN	15:	
l. Helium; He;	7440-59-7		C1	ever, H.L.;Ba Saylor, J.H.;	Gross, P.M.	
2. Octane; C <sub>8</sub> H <sub>1</sub>	8; 111-65-9					
			<u>J</u> .	Phys. Chem.	1957, <u>61</u> , 1078	-1083.
VARIABLES:			PREI	PARED BY:	_	
T/K: 28	8.15 - 314. <sup>•</sup>	75 atm)		P.I	Long	
	JI.JZJ (I (					
EXPERIMENTAL VALUES	:	Mol Fractio	n	Bunsen	Ostwald	
		$X_1 \times 10^4$		Coefficient	Coefficient L x 10 <sup>2</sup>	
	288.15	2.17		3.00	3.17	
	298.15	2.42		3.22	3.52	
	314.75	2.87		3.85	4.44	
Smoothed Data		1 - 7026 1	L 12	601 m Dr	1 lm V	
Smoothed Data.	Std. Dev. /	$\Delta G^{O} = 2.7.$	Coe	f. Corr. $0.99$	. <u>111 ^1</u> 199	
						- • • •
See the evaluat: energy equation	ion of the l and recomm	helium + oct ended solubi	ane llit	system for t v values.	the recommended	Gibbs
51 1				•		
There is a repo by dilatometry a	rt of the pa at 298.15 K	of 47.8 + 1	L vo L cm	lume of heliu 3 mol <sup>-1</sup> (3).	um diss <b>o</b> lved in	octane
	<u>.</u>					
The Bunsen Coer	ricients we	re calculate		y the compile	er.	
The solubility v 101.325 kPa (1 a	values were atm) by Hen:	adjusted to ry's law.	baj	partial press	sure of helium	of
			,			
		AUXILIARY	INFO	RMATION		
METHOD: Volumetric	. The solve	ent is sat-	SOUF	CE AND PURITY (	OF MATERIALS:	
urated with gas an 8 mm x 180 cn	as it flows a glass spir	s through ral attached	1.	Helium. Math	neson Co. Both	standard sed.
to a gas buret.	The total r	pressure is				_
absorbed.	atm as the	gas is	2.	Octane. Hump N. Haven, CN	hrey-Wilkinson 1. Shaken with	Inc., H <sub>a</sub> SO,,
				washed, drie	ed over sodium,	diś- <sup>4'</sup>
				tilled.		
APPARATUS/PROCEDURE	The appara	atus is a	EST	IMATED ERROR:	T/K = 0.05	
modification of	that of Mon	rrison and		δ	P/torr = 3	
clude the additi	on of a spi	iral stor-		83	$x_1/x_1 = 0.03$	
age for the solu	vent, a mano	ometer for a	REF	ERENCES :	- <u>-</u>	
extra buret for	highly solu	uble gases.	1.	Morrison, T.J.	;Billett, F.	
The solvent is d	legassed by	a modi- Baldwin and	<u>J</u> .	Chem.Soc. 194	10,2033; <u>101d.</u> 19	22, 3819
Daniel (2).		Sarawrii and	2.	Baldwin, R.R. J. Appl. Chem	, Janier, S.G. n. 1952, 2, 161	
			3.	Ng, W.Y.;Walk	ley, J.	
				J. Phys. Cher	n. 1969, <u>73</u> , 22	74.

COMPONENTS:	7440-50-7		Wilcock D	DREMENTS:
I. Hellum; He	/440-59-/		Danfor	th, W.F; Wilhelm, E.
2. Octane; C <sub>g</sub> I	18; 111-65-9		<u>J.Chem.The</u>	<u>rmodyn</u> . 1978, <u>10</u> , 817-822.
VARIABLES:			PREPARED BY:	
т/к:	288.23 - 312.9	2		A L. Cramer
P/kPa:	101.325 (1 atm	1)		
EXPERIMENTAL VALUE	S:			
	T/K Mol Fr	action C	Bunsen oefficient	Ostwald Coefficient
	X_1 ×	: 10 <sup>4</sup>	α x 10 <sup>2</sup>	$L \times 10^2$
	283.23 1.	.933	2.697	2.797
	298.33       2.         312.92       2.	, 370 , 733	3.250 3.685	3.550 4.221
Smoothed Data:	$\Delta G^{O}/J \text{ mol}^{-1} =$	= -RT ln X	1 = 8585.2	+ 40.731 T
	Std. Dev. $\Delta G^{C}$	) = 27, Co	ef. Corr. =	0.9990
The solubility 101.325 kPa (1 The Bunsen coe A preliminary {C.R.}, 4th 19	values were ad atm) by Henry' fficients were report of this 75, <u>6</u> , 122 - 12	ljusted to s law. calculate work appe 28; <u>Chem</u> .	a partial d by the co ared in <u>Con</u> <u>Abstr</u> . 1977	pressure of helium of mpiler. <u>f. Int. Thermodyn</u> . <u>Chim</u> ., , <u>86</u> , 22375d.
Law .		AUXILIARY	INFORMATION	
METHOD /APPARATU	IS/PROCEDURE:		SOURCE AND PU	JRITY OF MATERIALS:
The apparat sign of Morris the version us Battino, Evans degassing appa described by B and Wilhelm (3 Degassing. solvent is play size that the deep. The lig and vacuum is through a ligu	us is based on on and Billett ed is described , and Danforth ratus and proce attino, Banzhof ) Up to 500 cm <sup>3</sup> ced in a flask liquid is about id is rapidly applied intermation	the de- (1), and by (2). The edure are f, Bogan, of of such stirred, ittently il the	<ol> <li>Helium Purest grade.</li> <li>Octane 99 mol</li> </ol>	<ul> <li>Matheson Co. Inc.</li> <li>commercially available</li> <li>Phillips Petroleum Co.</li> <li>per cent minimum.</li> </ul>
permanent gas to 5 microns. Solubility gassed solvent	residual pressu Determination. is passed in a	The de- a thin	ESTIMATED ER	ROR: $\delta T/K = 0.03$ $\delta P/mmHg = 0.5$ $\delta X_1/X_1 = 0.02$
film down a gl taining the so vent vapor at atm. The volu found by differ tial and final system. The so a tared flask	ass spiral tube lute gas plus t a total pressur me of gas absor rence between t volumes in the olvent is colle and weighed.	e con- the sol- te of one thed is the ini- e buret ected in	REFERENCES: 1. Morrison J. Chem. 2. Battino, J.Am.Oil 3. Battino, Wilhelm, Anal Ch	T.J.;Billett,F. Soc. 1948, 2033. R.;Evans,F.D.;Danforth,W.F. <u>Chem.Soc</u> . 1968, <u>45</u> , 830. R.;Banzhof,M.;Bogan,M.; E.

COMPONENTS :	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.		
2. 3-Methylheptane; C <sub>8</sub> H <sub>18</sub> ; 589-81-1			
	<u>J. Phys. Chem. 1957, 61</u> , 1078-1083.		
VARIABLES:	PREPARED BY:		
T/K: 288.15 - 314.75	P. L. Long		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
$x_1 \times 10^4$	$\frac{\alpha \times 10^2}{\text{L} \times 10^2}$		
288.15 2.24	3.12 3.29		
314.75 2.95	3.98 4.59		
Smoothed Data: $\triangle G^{\circ}/J \mod^{-1} = -RT \ln$	$X_{-} = 7823.7 + 42.733 T$		
Sta. Dev. $\Delta G^{\circ} = 4.9$ ,	coer. corr. = 0.9999		
$\Delta H^{\circ}/J \text{ mol}^{-1} = 7823.7,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -42.733$		
T/K MOI Fract	$\Delta G^{2}/5$ mol -		
288.15 2.24	20,137		
	20,351		
303.15 2.63	20,778		
308.15 2.76	20,992		
313.15 2.90 318.15 3.04	21,206 21,419		
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.			
The Bunsen coefficients were calculate	ed by the compiler.		
AUXILIARY	INFORMATION		
	SOURCE AND PURITY OF MATERIALS.		
urated with gas as it flows through	1. Helium, Matheson Co., Inc. Both		
an 8 mm x 180 cm glass spiral attached	standard and research grades were		
to a gas buret. The total pressure of solute gas plus solvent vapor is	used.		
maintained at 1 atm as the gas is	2. 3-Methylheptane. Humphrey-		
absorbed.	H <sub>2</sub> SO <sub>4</sub> , washed, dried over Na,		
	distilled through a vacuum column		
	1		
	ESTIMATED ERROR:		
APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and	$\delta T/K = 0.05$		
Billett (1). The modifications in-	$\frac{\delta P}{torr} = 3$		
clude the addition of a spiral stor-	01/11 - 0.05		
a constant reference pressure, and an	REFERENCES:		
The solvent is decassed by a modi-	J. Chem. Soc. 1948, 2033;		
fication of the method of Baldwin and	<u>ibid.1952, 3819.</u>		
Daniei (2).	2. Baldwin, R. R.; Daniel, S. G.		
	<u>J. App1. Chem. 1952, 2, 161.</u>		

COMPONENTS:	ORIGINAL MEASUREMENTS:		
l. Helium; He; 7440-59-7	Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.		
2. 2,3-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ; 584-			
94-1	J. Phys. Chem. 1957, 61, 1078-1083.		
	<u></u> , <u></u> , <u></u> , <u></u> , <u></u> ,		
VARIABLES:	PREPARED BY:		
т/к: 288.15 - 314.05	P. L. Long		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
$ x_1 \times 10^4 $	$\begin{array}{c} \alpha \times 10^2 \\ \hline \end{array} \begin{array}{c} L \times 10^2 \\ \hline \end{array}$		
288.15 2.26	3.19 3.37		
298.15 2.47 314.05 2.89	3.44 3.76 3.95 4.54		
Smoothed Data: $\Delta G^{2}/J \mod 2 = RT \ln x$	1 = 7200.1 + 44.850 T		
Std. Dev. ∆G° = 15.8,	Coef. Corr. = 0.9996		
$\Delta H^{\circ}/J \text{ mol}^{-1} = 7200.1,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -44.850$		
T/K Mol Fract	ion ΔG°/J mol <sup>-1</sup>		
<u> </u>			
288.15 2.25	20,124		
293.15 2.37 298.15 2.49	20,348		
303.15 2.61	20,796		
308.15 2.73 313 15 2.86	21,021 21,245		
318.15 2.99	21,469		
The solubility values were adjusted to a partial pressure of helium of			
The Bunsen coefficients were calculat	ed by the compiler.		
AUXILIARY	INFORMATION		
METHOD: Volumetric. The solvent is sat-	SOURCE AND PURITY OF MATERIALS:		
urated with gas as it flows through an 8 mm x 180 cm glass spiral at-	1. Helium. Matheson Co., Inc. Both standard and research grades were		
tached to a gas buret. The total	used.		
pressure of solute gas plus solvent vapor is maintained at 1 atm as	2. 2,3-Dimethylhexane. Humphrey-		
the gas is absorbed.	Wilkinson, Inc. Shaken with		
	distilled through a vacuum column		
	ECTIVATIO EDDOD.		
APPARATUS/PROCEDURE: The apparatus is a	$\delta T/K = 0.05$		
modification of that of Morrison and Billett (1).The modifications in-	$\delta P / t. orr = 3$ $\delta X_1 / X_1 = 0.03$		
clude the addition of a spiral stor-	1 1		
age for the solvent, a manometer for a constant reference pressure, and an	REFERENCES:		
extra buret for highly soluble gases.	1. Morrison, T. J.; Billett, F.		
fication of the method of Baldwin and	ibid.1952, 3819.		
Daniel (2).	2. Baldwin, R. R. Daniel S. G.		
	J. Appl. Chem. 1952, 2, 161.		

COMP ONENTS :			ORIGINAL MEASUREMENTS:
			Clever, H. L.; Battino, R.;
1. Helium; He	; 7440-59-7		Saylor, J. H.; Gross, P. M.
2. 2,4-Dimeth	ylhexane;	C <sub>8</sub> H <sub>18</sub> ; 589-	
43-5			J. Phys. Chem. 1957, 61, 1078-1083.
VARIABLES:			PREPARED BY:
т/к:	288.15 - 31	4.15	P. L. Long
P/kPa:	101.325 (1	atm)	
EXPERIMENTAL VALUE	::		•
	Т/К Мо	l Fraction	Bunsen Ostwald
		$x_1 \times 10^4$	$\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \\ \hline \end{array}$
	288.15	2.42	3.35 3.53
	298.15 314.15	2.72	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
		-1 -1 -1 -1	
Smootned Data:	VG. A WOT	$= RT \ln x$	1 = 9304.5 + 36.983 T
	Std. Dev.	$\Delta G^{\circ} = 17.7,$	Coef. Corr. = 0.9993
	∆H°/J mol	-1 = 9304.5,	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -36.983$
	т/к	Mol Fract	tion $\Delta G^{\circ}/J \text{ mol}^{-1}$
	-,	X <sub>1</sub> x 10	04
	288.1	5 2.41	19.961
	293.1	5 2.57	20,146
	298.1	5 2.74 5 2.92	20,331 20,516
	308.1	5 3.10	20,701
	313.1 318.1	5 3.28 5 3.47	21,070
The solubility values were adjusted to a partial pressure of helium of			
The Bunsen coe	ficients w	ere calculate	ed by the compiler.
-			
		AUXILIARY	INFORMATION
METHOD: Volumetri	ic. The so	lvent is	SOURCE AND PURITY OF MATERIALS:
saturated with through an 8 m	gas as it n x 180 cm ·	tlows glass spiral	<ol> <li>Helium. Matheson Co., Inc. Both standard and research grades were</li> </ol>
attached to a gas buret. The total		The total	used.
vapor is mainta	ained at 1	atm as the	2. 2,4-Dimethylhexane. Humphrey-
gas is absorbed	1.		Wilkinson, Inc. Shaken with
			distilled through a vacuum column
			FSTIMATED EDDOD.
APPARATUS/PROCEDUR	E:The appar	atus is a	$\delta T/K = 0.05$
Billett (1).The	e modificat	ions in-	$\delta P/torr = 3$ $\delta x_1/x_1 = 0.03$
clude the addit	ion of a s	piral stor-	
a constant refe	erence pres	sure, and an	REFERENCES :
extra buret for The solvent is	highly so degassed b	luble gases. y a modi-	1. Morrison, T. J.; Billett, F.
fication of the method of Baldwin and Daniel (2).		Baldwin and	ibid. 1952, 3819.
			2. Baldwin, R. R. Daniel S. G.
			<u>J. Appl. Chem.</u> 1952, <u>2</u> , 161.

00100000000				
COMPONENTS:			ORIGINAL MEAS	UREMENTS:
l. Helium; He	; 7440-59-7		Clever, H.	L.; Battino, R;
$2$ $2$ $2$ $4-\pi$ rim	athulnentane (		Saylor,	J. H.; Gross, P. M.
octane; C <sub>8</sub> H	H <sub>18</sub> ; 540-84-1	[30-		
Ŭ	20		T Phys C	bem 1957 61 1078-1083
			<u>u</u> . <u>my</u> . <u>u</u>	<u>Hem</u> . 1997, <u>01</u> , 1070-1003.
VARIABLES:			PREPARED BY:	
т/к: 2	288.15 - 314.95	5		P. L. Long
P/kPa: ]	L01.325 (1 atm	n)		
EXPERIMENTAL VALUE	S:			
		ration	Buncon	Ostupld
	I/K MOI FI		Coefficient	Coefficient
	X_1 :	< 10 <sup>4</sup>	α x 10 <sup>2</sup>	$L \times 10^2$
	288.15 2.	.76	3.76	3.97
	298.15 3. 314.95 3.	.10 .63	4.20 4.80	4.58
	<u> </u>			
Smoothed Data:	∆G°/J mol - =	= - RT 1n	$x_1 = 7670.1$	+ 41.489 T
	Std. Dev. $\Delta G^{\circ}$	9 = 11.6,	Coef. Corr	. = 0.9998
	AH°/J mol-1 =	= 7670.1.	∧s°/J K-l	$mol^{-1} = 41.489$
			, ,-	
	T/K	Mol Fract	$\Delta G^{\circ}/J$	mol -
	288.15	2.77	19,	625 833
	298.15	3.08	20,	040
	303.15	3.24	20,	248
	308.15	3.41	20, 20,	663
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.				
The Bunsen coef	fficients were	calculate	ed by the co	mpiler.
		AUXILIARY	INFORMATION	
METHOD: Volumetri	ic. The solver	nt is	SOURCE AND PU	RITY OF MATERIALS:
saturated with	gas as it flow	vs s snimpl	1. Helium	. Matheson Co., Inc. Both
attached to a g	jas buret. The	e total	used.	iu and research grades were
pressure of sol	lute gas plus s	solvent		Trimothylpontano Enjay
gas is absorbed	ained at i atm	as the	Co.	Used as received.
5				
			ESTIMATED ERF	COR:
APPARATUS/PROCEDUR	E: The apparatu	is is a		$\delta T/K = 0.05$
Billett (1). Th	ne modification	ison and is in-		$\delta X_1 / X_1 = 0.03$
clude the addit	ion of a spira	al stor-		1 1
age for the sol	lvent, a manome erence pressure	eter for	REFERENCES:	
extra buret for	highly solub	le gases.	1. Morris	on, T. J.; Billett, F.
The solvent is	degassed by a method of Bal	modi- dwin and	J. Che Thid 1	m. <u>soc. 1948, 2033;</u> 952. 3819.
Daniel (2).			,	
		2. Baldwi	n, R. R.; Daniel, S. G.	
			<u>n</u> <u>v</u>	<u> </u>

COMPONENTS :	ORIGINAL MEASUREMENTS:	
1. Helium; He; 7440-59-7	Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.	
2. Nonane; CoH <sub>20</sub> ; 111-84-2		
5 20	J. Phys. Chem. 1957, 61, 1078-1083.	
VARIABLES:	PREPARED BY:	
т/к: 288.15 - 314.95	P. L. Long	
P/kPa: 101.325 (1 atm)		
T/K Mol Fra	ction Bunsen Ostwald	
X_ x	$10^{4} \qquad \begin{array}{c} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^{2} & \text{L} \times 10^{2} \end{array}$	
288.15 2.0	3 2.56 2.70	
298.15 2.4 314.95 2.8	1 3.00 3.28 7 3.53 4.07	
	<u> </u>	
Smoothed Data: $\Delta G^{\circ}/J \mod T = 0$	$- \operatorname{RT} \ln x_1 = 9558.8 + 37.394 \mathrm{T}$	
Std. Dev. ∆G°	= 49.7, Coef. Corr. = 0.9952	
$\Delta H^{\circ}/J \text{ mol}^{-1} =$	9558.8, $\Delta S^{\circ}/J K^{-1} mol^{-1} = -37.394$	
т/к м	ol Fraction AG°/J mol <sup>-1</sup> X <sub>1</sub> x 10 <sup>4</sup>	
288.15	2.06 20,334	
293.15 298.15	2.21 20,521 2.36 20,708	
303.15	2.51 20,895	
313.15	2.83 21,269	
318.15	3.00 21,456	
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (l atm) by Henry's law.		
The Bunsen coefficients were c	alculated by the compiler.	
A	UXILIARY INFORMATION	
METHOD: Volumetric. The solvent urated with gas as it flows th an 8 mm x 180 cm glass spiral tached to a gas buret. The to pressure of solute gas plus so vapor is maintained at 1 atm as	is sat-SOURCE AND PURITY OF MATERIALS: rough 1. Helium. Matheson Co., Inc. Both at- standard and research grades tal were used. lvent s the 2. Nonane. Phillips Petroleum Co.	
gas is absorbed.	Used as received.	
ADDED NOTE. Makranczy, J.; Meg Balog, K.;Rusz, L.;Patyi, L. H Ind. Chem. 1976, <u>4</u> , 269 report Ostwald coefficient of 0.028 a K for this system. The value w used in the smoothed data fit	yery- ung. J. an t 298.15 as not above.	
APPARATUS/PROCEDURE: The apparatus	is a fm (r = 0.05	
modification of that of Morriso Billett (1). The modifications	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
age for the solvent, a manometer	er for	
a constant reference pressure, extra buret for highly soluble The solvent is degassed by a m figure of the method of Pald	and an gases. odi- J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.	
Daniel (2).	2. Baldwin, R. R.; Daniel, S. G. J. <u>Appl</u> . <u>Chem</u> . 1952, <u>2</u> , 161.	

COM	PONENTS:	EVALUATOR:
1.	Helium; He; 7440-59-7	H. L. Clever Chemistry Department
2.	Decane; C <sub>10</sub> H <sub>22</sub> ; 124-18-5	Emory University Atlanta, Georgia 30322 U.S.A.
		April 1978

CRITICAL EVALUATION:

The solubility of helium in decane was measured by Clever, Battino, Saylor, and Gross (1), by Makranczy, Megyery-Balog, Rusz, and Patyi (2), and by Wilcock, Battino, and Danforth (3).

The value of Makranczy et al. (Ostwald coefficient 0.025, mole fraction 2.0 x  $10^{-4}$  at 298.15 K) is not recommended. It was reported to only two significant figures and it is 15 - 20 percent lower than the smoothed data value at 298.15 K from the other two laboratories.

The smoothed data values of Wilcock et al. range from 4.4 percent higher at 288.15 K to 1.7 percent higher at 313.15 K. The two data sets agree within experimental error but the more recent data were determined with a better degassing procedure and with better control of temperature and pressure than used in the earlier work. Thus the data sets were combined with a weight of 2 to the Wilcock  $\underline{et}$  al. values and a weight of 1 to the Clever  $\underline{et}$  al. values by the method of least squares to a Gibbs energy equation linear in temperature. The solubility value at 288.35 K (1) was more than two standard deviations from the fit. It was omitted and the remaining solubility values were fitted again.

The recommended values for the thermodynamic changes in transfer of one mole of helium from a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 6,619.1 + 47.144 T$ 

Std. Dev. ∆G° = 31, Coef. Corr. = 0.9987

 $\Delta H^{\circ}/J \mod^{-1} = 6,619.1, \Delta S^{\circ}/J K^{-1} \mod^{-1} = -47.144$ 

The recommended mole fraction solubility and Gibbs energy values are in Table 1.

TABLE 1. The solubility of helium in decane. The mole fraction solubility and the Gibbs energy at 101.325 kPa as a function of temperature.

Т/К	Mol Fraction X <sub>1</sub> x 10 <sup>4</sup>	∆G°/J mol <sup>-1</sup>
283.15	2.072	19,968
288.15	2.176	20,203
293.15	2.281	20,439
298.15	2.387	20,675
303.15	2.494	20,911
308.15	2.603	21,146
313.15	2.713	21,382
318.15	2.823	21,618

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, <u>61</u>, 1078.

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. 2.

<sup>&</sup>lt;u>Chem.</u> 1976, <u>4</u>, 269. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. <u>Chem. Thermodyn.</u> 1978, <u>10</u>, 817. з.

COMPONENTS : ORIGINAL MEASUREMENTS: Clever, H. L.; Battino, R.; 1. Helium; He; 7440-59-7 Saylor, J. H.; Gross, P. M. 2. Decane; C<sub>10</sub>H<sub>22</sub>; 124-18-5 J. Phys. Chem. 1957, 61, 1078-1083 VARIABLES: PREPARED BY: P. L. Long T/K: 288.35 - 314.55 P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES: T/K Mol Fraction Bunsen Ostwald  $\begin{array}{c} \text{Coefficient} \\ \alpha \times 10^2 \\ \text{L} \times 10^2 \end{array}$  $x_1 \times 10^4$ 288.35 2.04 2.35 2.48 298.15 2.39 2.73 2.98 314.55 2.69 3.02 3.48 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 7690.5 + 43.806 T$ Std. Dev.  $\Delta G^{\circ} = 69.7$ , Coef. Corr. = 0.9929 See the evaluation of helium + decane for the recommended Gibbs energy equation and the recommended solubility values. The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat. SOURCE AND PURITY OF MATERIALS: urated with gas as it flows through an 8 mm x 180 cm glass spiral at-1. Helium. Matheson Co., Inc. Both tached to a gas buret. The total standard and research grades were pressure of solute gas plus solvent vapor is maintained at 1 atm as the used. gas is absorbed. 2. Decane. Humphrey-Wilkinson, Inc. Shaken with  $H_2SO_4$ , washed, dried over Na. ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a  $\delta T/K = 0.05$ modification of that of Morrison and Billett (1). The modifications in- $\delta P/torr = 3$  $\delta x_1 / x_1 = 0.03$ clude the addition of a spiral storage for the solvent, a manometer for **REFERENCES:** a constant reference pressure, and an extra buret for highly soluble gases. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819. 1. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). 2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS :	ORIGINAL MEASUREMENTS:
1. Helium: He: 7440-59-7	Wilcock, R.J.; Battino, R.;
_,,,, ,, ,	Danforth, W.F; Wilhelm, E.
2. Decane; $C_{10}H_{22}$ ; 124-18-5	
10 22	<u>J.Chem.Thermodyn</u> . 1978, <u>10</u> , 817-822.
VARIABLES:	PREPARED BY:
T/K: 283.18 - 313.35	
P/kPa: 101.325 (1 atm)	A.L. Cramer
EXPERIMENTAL VALUES:	
T7K Mol Fraction	Bunsen Ostwald
	Coefficient Coefficient
X <sub>1</sub> x 10 <sup>4</sup>	$\alpha \times 10^2$ L x $10^2$
283.18 2.081	2.420 2.509
298.23 2.367	2.710 2.959
313.35 2.756	3.105 3.562
······································	
Smoothed Data: $\Delta G^{-}/J \mod - RT \ln 2$	$x_1 = 6885.8 + 46.223 \text{ T}$
Std Dev $AG^{O} = 26$	pef Corr = 0.9993
See the evaluation of helium + decane	for the recommended Gibbs energy
equation and recommended solubility v	alues.
The solubility values were adjusted to	a partial pressure of helium of
101.325 kPa (1 atm) by Henry's law.	s a partiar probare or nerram or
The Bunsen coefficients were calculate	ed by the compiler.
A preliminary report of this work app	eared in Conf. Int. Thermodyn. Chim.,
(C.R.), 4th 1975, <u>6</u> , 122-128; <u>Chem Ab</u>	SEL, 1977, 00, 223730.
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	<u></u> ,, <u></u> ,,
	<u></u> ,,,
	<u></u> ,, <u></u> ,
AUXILIARY	INFORMATION
AUXILIARY	INFORMATION SOURCE AND PURITY OF MATERIALS:
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de-	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Patting Product (2)	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degaseing apparatus and procedure	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decame. Phillips Petroleum Co.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino. Banzhof.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>
AUXILIARY METHOD /APPARATUS/PROCEDURE: The apparatus is based on the de- sign of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3). See the helium + octane data sheet for more details.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co. Inc. Purest commercially available grade. 2. Decane. Phillips Petroleum Co. 99 mol per cent minimum. ESTIMATED ERROR:</pre>

.

COMPONE NTS :	ORTGINAL MEASUREMENTS .
1. Helium; He; 7440-59-7	Makranczy, J.; Megyery-Balog, K.;
2. Undecane, C. How; 1120-21-4	Rusz, L.; Patyi, L.
	<u>Hung. J. Ind. Chem. 1976, 4</u> , 269-280.
VARIABLES: T/K: 298.15	PREPARED BY:
P/kPa: 101.325 (1 atm)	
EXPERIMENTAL VALUES.	
T/K Mol Fraction	Bunsen Ostwald
$x_1 \times 10^4$	Coefficient Coefficient α x 10 <sup>2</sup> L x 10 <sup>2</sup>
$\frac{1}{298.15}$ $\frac{1}{1.9}$	2.0 2.2
The mole fraction and Bunsen coefficient were calculated by the compiler.	
ΑΠΥΤΙΤΑΡΥ ΤΝΕΟΡΜΑΤΤΟΝ	
AUXILIARY INFORMATION	
Volumetric method, The apparatus of	SOURCE AND PURITY OF MATERIALS: Both the gas and liquid were analyti-
Bodor, Bor, Mohai, and Sipos (1) was used.	cal grade reagents of Hungarian or foreign origin. No further informa-
	tion.
1	
	ESTIMATED ERROR:
ALLANATUS/ FRUCEDUKE:	$\delta X_{x} / X_{z} = 0.03$
	PEFEDENCES ·
	1. Bodor, E.; Bor, Gy.; Mohai, B.;
	Sipos, G.
	1957, 1, 55;
	<u>Chem</u> . <u>Abstr</u> . 1961, <u>55</u> , 3175h.

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COMPONENTE		
COMPONENTS:	ORIGINAL MEASUREMENTS:	
1. Helium; He; 7440-59-7	Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.	
2. Dodecane; C <sub>12</sub> H <sub>26</sub> ; 112-40-3		
	J. Phys. Chem. 1957, 61, 1078-1083.	
VARIABLES:	PREPARED BY:	
T/K: 288.15 - 314.55	P. L. Long	
P/kPa: 101.325 (1 atm)		
EXPERIMENTAL VALUES:		
T/K Mol Fraction	Bunsen Ostwald	
$x_1 \times 10^4$	Coefficient Coefficient $\alpha \times 10^2$ L x $10^2$	
	2.09 2.09	
314.55 2.58	2.49 2.87	
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$	$X_1 = 7207.5 + 45.761 \text{ T}$	
	Coof Corr = 0.0006	
Sta. Dev. $\Delta G^{\circ} = 16.4$ ,	COEI. COII. = 0.9996	
$\Delta H^{\circ}/J \text{ mol}^{-1} = 7207.5,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -45.761$	
T/K Mol Fract X <sub>1</sub> x 10	Lion ∆G°/J mol <sup>−1</sup> 0 <sup>4</sup>	
288.15 2.01	20.394	
293.15 2.12	20,622	
298.15 2.22	20,851	
303.15 2.33	21,080	
308.15 2.44	21,309	
313.15 2.56	21,538	
318,15 2,67	21,766	
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.		
The Bunsen coefficients were calculated by the compiler.		
AUXILIARY	INFORMATION	
METHOD		
METHOD Volumetric. The solvent is sat-	SOURCE AND PURITY OF MATERIALS:	
an 8 mm x 180 cm glass spiral at-	1. Hellum. Matheson Co., Inc. Both	
tached to a gas buret. The total	were used.	
Pressure of solute gas plus solvent		
vapor is maintained at 1 atm as the	2. Dodecane. Humphrey-Wilkinson,	
gas is absorbed.	Inc. Shaken with H <sub>2</sub> SO <sub>4</sub> , washed,	
ADDED NOTE, Makranczy, J.: Megyery-	dried over Na.	
Balog, K.; Rusz, L.; Patvi, L. Hung, J.		
Ind. Chem. 1976, 4, 269 report an		
Ostwald coefficient of 0.022 at 298.1	E	
K for this system. The value was not	,	
used in the smoothed data fit above.	ECTIMATED EDDOD.	
APPARATUS/PROCEDURE: The apparatus is a	ESTIMATED ERROR:	
modification of that of Morrison and	$\delta T/K = 0.05$	
Billett (1). The modifications in-	$\delta P/torr = 3$	
clude the addition of a spiral stor-	$0x_1/x_1 = 0.03$	
age for the solvent, a manometer for	REFERENCES	
a constant reference pressure, and an	1. Morrison, T. J.: Billett. F	
The solvent is decreased by a modi-	J. Chem. Soc. 1948, 2033;	
fication of the method of Baldwin and	ibid.1952, 3819.	
Daniel (2).		
	2. Baldwin, R. R.; Daniel, S. G.	
	<u>J. Appi. Cnem. 1952, 2. 161.</u>	

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COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.		
2. Tridecane; C <sub>13</sub> H <sub>28</sub> ; 629-50-5			
	Hung. J. Ind. Chem. 1976, 4, 269-280.		
VARIABLES:	PREPARED BY:		
T/K: 298.15 P/kPa: 101.325 (1 atm)	S. A. Johnson		
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
X <sub>1</sub> x 10 <sup>4</sup>	$\alpha \times 10^2$ L x $10^2$		
298.15 1.9	1.7 1.9		
The mole fraction and Bunsen coeffi	cient were calculated by the compiler.		
AUXILIA	RY INFORMATION		
METHOD:	SOURCE AND PURITY OF MATERIALS:		
Volumetric method. The apparatus of	f Both the gas and liquid were analvti-		
Bodor, Bor, Mohai, and Sipos (1) was used.	s cal grade reagents of Hungarian or foreign origin. No further informa- tion.		
APPARATUS/PROCEDURE:	ESTIMATED ERROR:		
	$\delta X_{1} / X_{1} = 0.03$		
	REFERENCES :		
	1. Bodor, E.; Bor, Gv.; Mohai, B.;		
	Sipos, G.		
	Veszpremi Vegyip. Egy. Kozl. 1957, 1, 55;		
	<u>Chem.</u> <u>Abstr</u> . 1961, <u>55</u> , 3175h.		

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COMPONENTS:			ORIGINAL MEAS	UREMENTS:
l. Helium; He; 7440-59-7		Clever, H. Saylor,	L.; Battino, R.; J. H.; Gross, P. M.	
2. Tetradecane	; C1/H20; 629-59	9-4		
	T4 20		J. Phys. C	hem. 1957, <u>61</u> , 1078-1083.
VARIABLES:	<del>~</del>		PREPARED BY:	
т/к: 2	88.35 - 314.10			P. L. Long
Р/кРа: 1	01.325 (1 atm)			
EXPERIMENTAL VALUES	;: 	<u></u>		
	T/K Mol Frac	ction	Bunsen	Ostwald Coefficient
	x <sub>1</sub> x 3	10 <sup>4</sup>	$\alpha \times 10^2$	$L \times 10^2$
	288.35 2.10	0	1.76	1.86
	298.15 2.20 314.10 2.60	6 N	1.99	2.17
-				
Smoothed Data:	$\Delta G^{\circ}/J \text{ mol}^{-1} = \cdot$	- RT ln	$x_1 = 6310.9$	) + 48.565 T
	Std. Dev. ∆G° :	= 17.3,	Coef. Corr	<b>.</b> = 0.9996
	$\Delta H^{\circ}/J \text{ mol}^{-1} = 0$	6310.9,	∆S°/J K <sup>-1</sup>	$mol^{-1} = -48.565$
		ol Fract	tion ∆G°/J	mol-1
		x <sub>1</sub> x 10	) <sup>4</sup>	
	288.15	2.09	20,	305
	293.15	2.18	20, 20,	548 791
	303.15	2.38	21	033
	308.15	2.47	21,	276 519
	318.15	2.67	21,	762
The solubility values were adjusted to a partial pressure of belium of				
101.325 kPa (1 atm) by Henry's law.				
The Bunsen coefficients were calculated by the compiler.			ompiler.	
	A	UXILIARY	INFORMATION	
METHOD: Volumetric. The solvent is sat- SOURCE AND PURITY OF MATERIALS:				
urated with gas	as it flows the	rough	l. Helium	Matheson Co., Inc. Both
tached to a gas	m glass spiral a buret. The to	at- tal	used.	ard and research grades were
pressure of sol	ute gas plus so	lvent	2 Totrad	logano Humphrou-Wilkingon
gas is absorbed		s the	Inc.	Shaken with $H_2SO_4$ , washed,
ADDED NOTE. Mak	ranczy, J.; Meg	yery-	dried	over Na.
Balog, K.;Rusz,	L.;Patyi, L. H	ung. J.		
Ostwald coeffic	ient of 0.017 a	t 298.15		
K for this syst	em. The value watched data fit	as not above.		
APPARATUS / PROCEDUR	F. The apparatus	is a	ESTIMATED ERI	ROR:
modification of that of Morrison and			$\delta T/K = 0.05$ $\delta P/torr = 3$	
Billett (1). The modifications in-			$\delta x_1 / x_1 = 0.03$	
age for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases.		REFERENCES		
		1. Morris	son, T. J.; Billett, F.	
The solvent is	degassed by a m	odi-	J. Che	em. Soc. 1948, 2033;
Daniel (2).	: method of \Bald	win and	<u></u>	
		2. Baldwi <u>J. App</u>	In, R. R.; Daniel, S. G. D1. <u>Chem</u> . 1952, <u>2</u> , 161.	

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COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.		
2. Pentadecane; C <sub>15</sub> H <sub>32</sub> ; 629-62-9			
or			
Hexadecane; C <sub>16</sub> H <sub>34</sub> ; 544-76-3	Hung. J. Ind. Chem. 1976, 4, 269-280.		
VARIABLES:	PREPARED BY:		
T/K: 298.15	S. A. Johnson		
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
$x_1 \times 10^4$	Coefficient Coefficient $\alpha \times 10^2$ L $\times 10^2$		
Pentadecan	e; C <sub>15<sup>H</sup>32</sub> ; 629-62-9		
298.15 1.8	1.5 1.6		
Hexadecane	; C <sub>16</sub> H <sub>34</sub> ; 544-76-3		
298.15 1.8	1.4 1.5		
The mole fraction and Bunsen coeffici	ent were calculated by the compiler.		
AUXILIARY	INFORMATION		
METHOD:	SOURCE AND PURITY OF MATERIALS:		
Volumetric method. The apparatus of	Both the gas and liquid were analyti-		
Bodor, Bor, Mohai, and Sipos (1) was used.	cal grade reagents of Hungarian or foreign origin. No further informa-		
	tion.		
	ESTIMATED ERROR:		
APPARATUS/PROCEDURE:	έν /ν = 0.02		
	<sup>0</sup> <sup>1</sup> <sup>1</sup> <sup>1</sup> = 0.03		
	REFERENCES:		
	Sipos, G.		
	Veszpremi Vegyip. Egy. Kozl.		
	$\begin{array}{c} 1337, 1, 337\\ \text{Chem Abstr 1961 55 3175h} \end{array}$		
	<u>Chem</u> . <u>Abaci</u> . 1901, <u>55</u> , 5175h.		

COMPONENTS:	EVALUATOR:	
l. Helium; He; 7440-59-7 2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 USA	
	January 1978	
CRITICAL EVALUATION: The solubility of helium in cyclohexane was measured by Lannung (1), and by Clever, Battino, Saylor and Gross (2). The two data sets agree to within better than one percent over 288 - 303 K, the temperature range of common measurement. The agreement is well within the estimated experi- mental error of the methods used. Dymond and Hildebrand (3) show a helium in cyclohexane solubility value at 298.15 K on a graph. Their value was not used in the evaluation.		
The two data sets were combined or recommended values (Table 1). The rec	on a one to one weight basis for the commended thermodynamic values for the	

transfer of one mole of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \mod^{-1} = 10,164 + 40.841 \text{ T}$ 

Std. Dev. △G° = 23.2, Coef. Corr. = 0.9980

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 10,164, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -40.841$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes are summarized at five degree intervals between 288.15 and 318.15 K in Table 2.

TABLE 1. Parameters for Gibbs energy equation.

$\Delta G^{\circ}/J \text{ mol}^{-1} = A + BT$	Std. Dev. $\Delta G^{\circ}$	No. Exp. Points	Weight	Reference
10,297 + 40.398 T 10,009 + 41.341 T	28.3 6.0	6 3	1 1	1 2
10,164 + 40.841 T	23.2	9		l + 2

Recommended mole fraction solubility and Gibbs energy of solution TABLE 2. at 101.325 kPa (1 atm).

Т/К	Mol Fraction X <sub>l</sub> x 10 <sup>4</sup>	∆G°/J mol <sup>-1</sup>
288.15	1.06	21,933
293.15	1.14	22,137
298.15	1.22	22,341
303.15	1.30	22,545
308.15	1.39	22,749
313.15	1.48	22,954
318.15	1.58	23,158

 Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Ch 1957, 61, 1078.
 Dymond, J.; Hildebrand, J. H. Ind. Eng. Chem. Fundam. 1967, 6, 130. J. Phys. Chem.

COMPONENTS:	IGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7 L	Lannung, A.		
2. Cyclohexane; C <sub>c</sub> H <sub>12</sub> ; 110-82-7			
1 1	. <u>Am. Chem. Soc</u> . 1930, <u>52</u> , 68 - 80.		
VARIABLES : PRF	EPARED BY:		
т/к: 288.15 - 303.15	P. L. Long		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction B     Coe     X1 x 104	unsen Ostwald fficient Coefficient x 10 <sup>2</sup> L x 10 <sup>2</sup>		
288.15 1.06	2.21 2.33		
288.15 1.05	2.20 2.32		
293.15 1.15	2.39 2.56		
303.15 1.32	2.70 3.00		
303.15 1.29	2.65 2.94		
Smoothed Data: $\Delta G^{\circ}/J \mod = -RT \ln x_1$	= 10,297 + 40.398  T		
Std. Dev. $\Delta G^{\circ} = 28.3$ , Co	oef. Corr. = 0.9948		
For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in cyclohexane.			
101.325 kPa (1 atm) by Henry's law.			
The mole fraction solubility and the Ost	wald coefficient were calculated by		
the compiler.			
AUXILIARY INF	ORMATION		
METHOD: SOU	JRCE AND PURITY OF MATERIALS:		
Gas absorption. The gas is presatu- 1.	. Helium. Linde's Liquid Air.		
volume absorbed is the difference	neon.		
between initial and final gas vol-			
umes. The amount of solvent is deter- 2, mined by the weight of mercury dis-	. Cyclohexane. Poulenc Frères, shaken with fuming sulfuric acid, separated and shaken with water		
praceu.	until neutral. Kept over P205, and		
	distilled over P <sub>2</sub> O <sub>5</sub> . First ½ re-		
	over Na, used m.p. 6.3°.		
	-		
APPARATUS/PROCEDURE: The apparatus is a	TIMATED ERROR:		
modification of that of von Antropoff	$\delta T/K = 0.03$		
(1). A calibrated, combined all glass manometer and bulb is enclosed in an			
air thermostat. Mercury is used as	PEDENCEC -		
the calibration and confining liquid.	remences:		
ratus. The solvent and the gas are	<u>Z. Electrochem. 1919, 25, 269.</u>		
shaken together until equilibrium is			
established.			

COMPONENTS:			ORIGINAL MEAS	IIREMENTS •
1. Helium; He; 7440-59-7		Clever, H. L.; Battino, R.;		
2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7		Saylor,	J. H.; Gross, P. M.	
		· · · · · · · · · · · · · · · · · · ·	J. Phys. C	<u>hem</u> . 1957, <u>61</u> , 1078 - 1083.
VARIABLES:	200 15	214 75	PREPARED BY:	
178:	288.15	- 314.75		P. L. Long
EXPERIMENTAL VALUE	S:	<u></u>		
	T/K	Mol Fraction	Bunsen	Ostwald
		$x_1 \times 10^4$	$\alpha \times 10^2$	$\frac{\text{Coefficient}}{\text{L x } 10^2}$
	288.15	1.06	2.20	2.32
	298.45 314.75	1.23 1.51	2.53 3.05	2.76 3.51
Smoothed Data:	∆G°/J :	mol <sup>-1</sup> = - RT ln	$x_1 = 10,009$	+ 41.341 T
	Std. D	ev. ∆G° = 6.0,	- Coef. Corr	. = 0.9999
For the recomm solubility of	ended fr helium i	ee energy equat: n cyclohexane.	ion see the	critical evaluation of the
The solubility values were adjusted to		o a partial	pressure of helium of	
101.325 kPa (l atm) by Henry's law.				
The Bunsen coefficients were calculated by the compiler.			mpiler.	
AUXILIARY		INFORMATION		
METHOD: Volumetr	ic. The	solvent is sat-	SOURCE AND PUI	RITY OF MATERIALS:
urated with gas as it flows through		l. Helium	. Matheson Co. Both re-	
to a gas buret	. The to	otal pressure	used w	ith no difference in re-
is maintained absorbed.	at 1 atm	as the gas is	sults.	
			2. Cycloh	exane. Phillips Petroleum
			receiv	ed.
APPARATUS / PROCEDUR	E: The a	pparatus is a	ESTIMATED ERR	OR:
Billett (1). The second	t that of he modif:	t Morrison and ications in-		$\delta T/K = 0.05$ $\delta P/torr = 3$
clude the addition age for the solution	tion of a lvent, a	a spiral stor- manometer for		$\delta X_1 / X_1 = 0.03$
a constant refe	erence p	ressure, and an	REFERENCES:	n T. I. Billett. F
The solvent is	degasse	d by a modifi-	J. Chem	. <u>Soc</u> . 1948, 2033;
Daniel (2).	μετησα Ο:	L BALGWIN ANG	<u>1010</u> . 1	327, 2013.
			2. Baldwin J. Appl	, R. R.; Daniel, S. G. . Chem. 1952, 2, 161.

COMPONENTS :	ORIGINAL MEASUREMENTS:	
	Clever, H. L.; Saylor, J. H.;	
1. Hellum; He; /440-59-7	Gross, P. M.	
2. Methylcyclohexane: C7H14:		
108-87-2		
	<u>J. Phys. Chem. 1958, 62</u> , 89 - 91.	
VARIABLES.	PREPARED BY:	
т/к: 289.15 - 316.25	P. L. Long	
P/kPa: 101.325 (1 atm)		
EXPERIMENTAL VALUES.		
T/K Mol Fraction	Bunsen Ostwald	
	Coefficient Coefficient	
$X_{1} \times 10^{4}$	$\alpha \times 10^2$ L $\times 10^2$	
280.15 1.46	2.57 2.72	
	2.57 2.72	
316.25 2.07	3.54 4.10	
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$	$X_1 = 9804.7 + 39.657 T$	
Std Dev $AG^{\circ} = 69.5$	Coef. Corr. = 0.9917	
$\Delta H^{\circ}/J \text{ mol}^{-1} = 9804.7,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -39.657$	
	· · · · · · · · · · · · · · · · · · ·	
T/K Mol Fract	$\Delta G^{\circ}/J \mod \frac{1}{2}$	
288.15 1.42	21.232	
293.15 1.52	21,430	
298.15 1.62	21,628	
	21,827	
313.15 1.96	22,025	
318.15 2.08	22,421	
	<u>.</u>	
The solubility values were adjusted to	a partial pressure of helium of	
101.525 KFa (1 acm) by henry 5 1aw.		
The Bunsen coefficients were calculate	ed by the compiler.	
AUXILIARY INFORMATION		
METHOD: Volumetric (1). The apparatus	SOURCE AND PURITY OF MATERIALS:	
is a modification of that used by	1. Helium. Matheson Co., Inc. Both	
Morrison and Billett (2). Modifica-	standard and research grades were	
tions include the addition of a	used.	
spiral solvent storage tubing, a manometer for constant reference	2 Methylcycloheyane Eastman	
pressure, and an extra gas buret for	Kodak Co., white label. Dried	
highly soluble gases.	over Na and distilled; corrected	
	b.p. 100.95 to 100.97°, lit.	
	b.p. 100.93°.	
	ESTIMATED ERROR.	
APPARATUS/PROCEDURE: (a.) Degassing.	$\delta T/K = 0.05$	
700 ml of solvent is shaken and	$\delta P/mm$ Hg = 3	
evacuated while attached to a cold	$\delta X_{1}/X_{1} = 0.03$	
trap, until no bubbles are seen; sol-		
1 mm. capillary tubing. released as a	REFERENCES:	
fine mist into a continuously evacu-	1. Clever, H. L.; Battino, R.;	
ated flask. (b.) Solvent is satura-	Saylor, J. H.; Gross, P. M.	
tea with gas as it flows through	$\underbrace{J. Pnys. Chem. 1957, 61, 1078.}_{\dots \dots $	
gas buret. Pressure is maintained at	2. Morrison, T. J.: Billett. F.	
1 atm. as the gas is absorbed.	J. Chem. Soc. 1948, 2033;	
	ibid.1952, 3819.	

600 (DO) (D) (D)			
COMPONENTS: 1. Helium; He; 7440-59-7		ORIGINAL MEASUREMENTS: Wilcock, R. J.; Battino, R; Wilhelm, E.	
2. Cyclooctane: C.H 292-64-8			
	, _, _, _	T Cham Thermodum 1077 0 111-115	
		<u>J. Chem. Thermodyn. 1977, 9</u> , 111-115.	
VARIABLES:		PREPARED BY:	
T/K: 289.23 -	313.51	H. L. Clever	
P/KPa: 101.325			
EXPERIMENTAL VALUES:			
т7к	Mol Fraction	Bunsen Ostwald	
	$x_1 \times 10^4$	$\frac{\alpha \times 10^2}{100} \qquad $	
289.23	0.805	1.35 1.429	
298.15 313.51	0.822 1.015	1.37 1.491 1.66 1.907	
Smoothed Data: $\Delta G^{\circ}/J$	$mol^{-1} = - RT ln$	$X_1 = 7618.0 + 52.284 \text{ T}$	
Std. D	ev. $\Delta G^{\circ} = 97.1$ ,	Coef. Corr. = 0.9888	
∆H°/J	$mol^{-1} = 7618.0,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -52.284$	
· · · · ·	m/v Mol Fract	tion $\Delta C^{\circ} (I mol^{-1})$	
	$\frac{1}{x_1} \times 10^{-1}$		
28	8.15 0.773	3 22,684	
29 29	03.15 0.816 08.15 0.860	6 22,945 0 23,207	
30	3.15 0.904	4 23,468	
30	.3.15 0.950	6 23,729	
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.			
	AUXILIARY INFORMATION		
METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).		SOURCE AND PURITY OF MATERIALS: 1. Helium. Matheson Co., Inc. Minimum purity 99.995 mol per cent.	
		2. Cyclooctane. Chemical Samples Co. 99 mol per cent, fractionally distilled, n(Na D, 298.15 K) = 1.4562.	
APPARATUS/PROCEDURE: De 500 cm <sup>3</sup> of solvent is p flask of such size that about 4 cm deep. The li	egassing. Up to blaced in a the liquid is quid is rapid-		
termittently through a until the permanent gas pressure drops to 5 mic Solubility Determinatic	liquid N <sub>2</sub> trap s residual crons. on. The de-	ESTIMATED ERROR: $\begin{array}{rcl} & \delta T/K &= 0.03 \\ & \delta P/mmHg &= 0.5 \\ & \delta X_1/X_1 &= 0.03 \end{array}$	
down a glass spiral cor solute gas and solvent total pressure of one a ume of gas absorbed is	taining the vapor at a atm. The vol- measured in	REFERENCES: 1. Morrison, T. J.; Billett, F. <u>J. Chem. Soc</u> . 1948, 2033.	
the attached gas buret, solvent is collected in and weighed.	, and the h a tared flask	2. Battino, R.; Evans, F. D.; Danforth, W. F. J. <u>Am. Oil Chem. Soc</u> . 1968, <u>45</u> , 830.	

COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Geller, E. B.; Battino, R.; Wilhelm, E.		
<ol> <li><u>cis-1,2-Dimethylcyclohexane;</u></li> </ol>			
C <sub>8</sub> H <sub>16</sub> ; 2207-01-4			
	<u>J. Chem. Thermodyn. 1976, 8, 197-202.</u>		
VARIABLES:	PREPARED BY:		
т/к: 297.96 - 298.28	H. L. Clever		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
X <sub>1</sub> × 10 <sup>4</sup>	$\frac{\alpha \times 10^2}{10^2} \qquad \frac{10^2}{10^2}$		
297.96 1.48	2.34 2.55		
<u> </u>	2.22 2.42		
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.			
AUXILIARY	INFORMATION		
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:		
design by Morrison and Billett (1) and the version used is described by Battino, Evans and Danforth (2).	1. Helium. Either Air Products & Chemicals, Inc. or Matheson Co., Inc., 99 mol % or better.		
APPARATUS/PROCEDURE: Degassing. Up to 500 cm <sup>3</sup> of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapid-	2. cis-1,2-Dimethylcyclohexane. Chemical Samples Co., fractional- ly distilled and stored in dark. n <sub>D</sub> (298.15 K) 1.4337.		
ly stirred, and vacuum is applied in-			
until the permanent gas residual	$\delta T/K = 0.03$		
pressure drops to 5 microns.	$\delta P/mmHg = 0.5$		
Solubility Determination. The de-	$0x_1/x_1 = 0.03$		
film down a glass spiral tube con-	REFERENCES :		
taining the solute gas plus the solvent vapor at a total pressure of	<ol> <li>Morrison, T. J.; Billett, F. J. <u>Chem</u>. <u>Soc</u>. 1948, 2033.</li> </ol>		
is found by difference between the	2. Battino, R.: Evans, F. D.:		
initial and final volumes in the	Danforth, W. F.		
collected in a tared flask and weighed.	J. Am. 011 Chem. Soc. 1968, 45, 830.		

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COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Geller, E. B.; Battino, R.;		
2. <u>trans</u> -1,2-Dimethylcyclohexane; C <sub>8</sub> H <sub>16</sub> ; 6876-23-9	willelm, E.		
	<u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.		
VADTADI EC.			
T/K: 298.03	PREPARED BY:		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K MOL Fraction	Bunsen Ostwald Coefficient Coefficient		
X <sub>1</sub> × 10 <sup>4</sup>	$\alpha \times 10^2$ L $\times 10^2$		
<u> </u>	2.78 3.03		
The solubility value was adjusted to 101.325 kPa (l atm) by Henry's law.	o a partial pressure of helium of		
The Bunsen coefficient was calculate	ed by the compiler.		
AUXILIARY	INFORMATION		
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:		
design by Morrison and Billett (1) and the version used is described by	1. Helium. Either Air Products &		
Battino, Evans, and Danforth (2).	Chemicals, Inc. or Matheson Co.,		
	2. trans-1,2-Dimethylcyclohexane. Chemical Samples Co. fractional-		
	ly distilled and stored in dark.		
APPARATUS/PROCEDURE: Decassing. Up to	n <sub>D</sub> (298.15) 1.4248.		
$500 \text{ cm}^3$ of solvent is placed in a			
flask of such size that the liquid is			
ly stirred and vacuum is applied in-	ESTIMATED ERROR:		
termittently through a liquid N <sub>2</sub> trap	$\delta T/K = 0.03$		
pressure drops to 5 microns.	$\delta P/mmHg = 0.5$ $\delta x_1/x_1 = 0.03$		
Solubility Determination. The de-			
down a glass spiral containing the	REFERENCES:		
solute gas plus the solvent vapor at	1. Morrison, T. J.; Billett, F.		
ume of gas absorbed is measured in a	J. Chem. 50C. 1948, 2033.		
buret system, and the solvent is	2. Battino, R.; Evans, F. D.;		
	Danforth W P		
weighed.	Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45.		

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COMPONENTS -	
COTIF UNENIO ;	ORIGINAL MEASUREMENTS:
l. Helium; He; 7440-59-7	Geller, E. B.; Battino, R.; Wilhelm. E.
2. <u>cis</u> -1,3-Dimethylcyclohexane; 59 mol %;C <sub>8</sub> H <sub>16</sub> ; 638-04-0	
3. <u>trans</u> -1,3-Dimethylcyclohexane; 41 mol %;C <sub>8</sub> H <sub>16</sub> ; 2207-03-6	<u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.
VARIABLES: T/K: 298.09	PREPARED BY:
P/kPa: 101.325 (1 atm)	H. L. Clever
EXPERIMENTAL VALUES:	
T/K Mol Fraction X <sub>1</sub> x 10 <sup>4</sup>	BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$
298.09 1.68	2.59 2.83
The solubility value was adjusted to 101.325 kPa (l atm) by Henry's law.	o a partial pressure of helium of
The Bunsen coefficient was calculate	ed by the compiler.
<b>n</b>	
AUXILIARY	INFORMATION
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:
design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).	<ol> <li>Helium. Either Air Products &amp; Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.</li> </ol>
	2. <u>cis-1,3-Dimethylcyclohexane</u> .
	Chemical Samples Co., binary mix-
	ors, used as received.
APPARATUS/PROCEDURE: Degassing. Up to	
500 cm <sup>3</sup> of solvent is placed in a	3. trans-1,3-Dimethylcyclohexane. Chemical Samples Co., binary mix-
flask of such size that the liquid is about 4 cm deep. The liquid is rapid-	ture, analysed by R. I. by auth-
ly stirred, and vacuum is applied in-	ors. used as received.
termittently through a liquid N <sub>2</sub> trap	ESTIMATED ERROR: $\delta \pi / \kappa = 0.03$
pressure drops to 5 microns.	$\delta P/mmHg = 0.5$
Solubility Determination. The de-	$\delta x_1 / x_1 = 0.03$
gassed solvent passes in a thin film down a glass spiral tube conatining	REFERENCES:
the solute gas plus the solvent vapor	1. Morrison, T. J.; Billett, F.
at a total pressure of one atm. The absorbed gas volume is measured in a	J. <u>Chem</u> . <u>Soc</u> . 1948, 2033.
buret system, and the solvent is	2. Battino, R.; Evans, F. D.;
collected in a tared flask and	Danforth, W. F.
WEIGHEG.	
	<u>J. Am. 011 Chem. Soc. 1968, 45,</u> 830.

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COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Hellum; He; 7440-59-7	Wilhelm, E.
2. <u>cis</u> -1,4-Dimethylcyclohexane; 70 mol %; C <sub>8</sub> H <sub>16</sub> ; 624-29-3	
3. <u>trans</u> -1,4-Dimethylcyclohexane; 30 mol %; C <sub>8</sub> H <sub>16</sub> ; 2207-04-7	<u>J</u> . <u>Chem</u> . <u>Thermodyn</u> . 1976, <u>8</u> , 197-202.
VARIABLES:	PREPARED BY:
T/K: 298.15 - 298.24	H. L. Clever
P/KPA: 101.325 (1 atm)	
EXPERIMENTAL VALUES:	
T/K Mol Fraction	Bunsen Ostwald
$x_1 \times 10^4$	Coefficient Coefficient $\alpha \times 10^2$ L x $10^2$
298.15 1.64	2.53 2.76
298.24 1.64	2.53 2.76
The solubility values were adjusted to 101.325 kPa (l atm) by Henry's law.	o a partial pressure of helium of
The Bunsen coefficients were calculate	ed by the compiler.
AUXILIARY	INFORMATION
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:
design by Morrison and Billett (1) and the version used is described by	I. Helium. Either Air Products & Chemicals, Inc., or Matheson Co.,
Battino, Evans, and Danforth (2).	Inc. 99 mol % or better.
	2. cis-1,4-Dimethylcyclohexane.
	Chemical Samples Co., binary mix-
APPARATUS/PROCEDURE: Degassing. Up to	ors, used as received.
500 cm <sup>3</sup> of solvent is placed in a	3 trans-1 4-Dimethylovcloberane
about 4 cm deep. The liquid is rapid-	Chemical Samples Co., binary mix-
ly stirred, and vacuum is applied in-	ors, used as received.
until the permanent gas residual	ESTIMATED ERROR:
pressure drops to 5 microns.	$\delta T/K = 0.03$ $\delta P/mmHq = 0.5$
gassed solvent is passed in a thin	$\delta X_1 / X_1 = 0.03$
film down a glass spiral tube con- taining the solute gas plus the	REFERENCES :
solvent vapor at a total pressure of	1. Morrison, T. J.; Billett, F.
one atm. The volume of gas absorbed is found by difference between the	<u>u. chem. 500</u> . 1946, 2055.
initial and final gas volume in the	2. Battino, R.; Evans, F. D.; Danforth, W. F.
lected in a tared flask and weighed.	J. Am. Oil Chem. Soc. 1968, 45,
	830.

COMPONENTS:	EVALUATOR:
<ol> <li>Helium; He; 7440-59-7</li> <li>Benzene; C<sub>6</sub>H<sub>6</sub>; 71-43-2</li> </ol>	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	January 1978

CRITICAL EVALUATION:

Since the early qualitative observation of Ramsay, Collie, and Travers (1) that helium is insoluble in benzene, the solubility of helium in benzene at 101,325 kPa (1 atm) was measured by Lannung (2), Clever, Battino, Saylor, and Gross (3), and de Wet (4). The three data sets and an equal weight calculation of the three were each fitted by the method of least squares to a free energy equation linear in temperature,

 $\Delta G^{\circ} = - RT \ln X_1 = A + BT.$ 

In the combined data least squares fit only the 298.15 K solubility value from reference 3 fell more than 2 standard deviations from the least square line. That value was omitted and a second least square linear fit found which is the recommended equation. The information on the linear free energy equations is summarized in Table 1. Table 2 contains the recommended mole fraction solubilities of helium in benzene at five degree intervals from 288.15 to 318.15 K.

The recommended thermodynamic values for the transfer of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 10,321 + 44,256 T$ 

Std. Dev. ∆G° = 22.6, Coef. Corr. = 0.9977

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 10,321, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -44.256$ 

TABLE 1. Parameters for  $\Delta G^\circ = A + BT$  Equation.

∆G°/J mol <sup>-1</sup>	Std. Dev. $\Delta G^{\circ}$	No. Exp. Points	Weight	Reference
10,318 + 44.260 T 10,242 + 44.422 T 10,057 + 45.153 T	25.0 51.2 25.6	10 3 3	1 1 1	2 3 4
I. 10,349 + 44.140 T II. 10,321 + 44.256 T	30.8 22.6	16 15		

TABLE 2. Solubility of Helium in Benzene. Recommended Mole Fraction Solubility and Gibbs Energy of Solution as a Function of Temperature.

T/K	Mol Fraction $X_1 \times 10^4$	∆G°/J mol <sup>-1</sup>
288.15	0.657	23,073
293.15	0.759	23,294
303.15 308.15	0.813 0.869	23,737 23,958
313.15 318.15	0.926 0.986	24,179 24,401
-	-	-

Popov and Drakin (5) calculated apparent molal volumes of helium dissolved in benzene at 298.15 K from their density measurements of the saturated solutions over the pressure interval of 10 - 100 atm. Their results are:

P/atm	9.98	29.36	58.60	78.30	97.66
$\nabla_1/cm^3 mol^{-1}$	33 ± 6	32 ± 2	30 ± 2	29 ± 0.7	24.4 ± 0.6

СОМ	PONENTS:	EVALUATOR:
1. 2.	Helium; He; 7440-59-7 Benzene; C <sub>6</sub> H <sub>6</sub> ; 71-43-2	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322
CRIT	FICAL EVALUATION:	
hel	No report of calorimetric measure ium in benzene was found.	ment of the enthalpy of solution of
1.	Ramsay, W.; Collie, J. N.; Travers <u>J. Chem</u> . <u>Soc</u> . 1895, <u>67</u> , 684.	, M.
2.	Lannung, A. J. Am. Chem. Soc. 193	0, <u>52</u> , 68.
з.	Clever, H. L.; Battino, R.; Saylor 1957, <u>61</u> , 1078.	, J. H.; Gross, P. M. <u>J. Phys</u> . <u>Chem</u> .
4.	de Wet, W. J. J. S. Afr. Chem. In	<u>st</u> . 1964, <u>17</u> , 9.
5.	Popov, G. A.; Drakin, S. I. Zh. F	<u>iz. Khim</u> . 1974, <u>48</u> , 631.

COMPONENTS :			ORIGINAL MEASU	REMENTS :	
		Lannung, A.			
1. Helium; He;	7440-59-	/			
2. Benzene; C <sub>6</sub> H	<sup>1</sup> 6; 71-43	-2			
			J. Am. Chem	. <u>Soc</u> . 1930,	<u>52</u> , 68 - 80.
VARIABLES:			PPEPAPED BY.		
т/к: 28	8.15 - 30	03.15	P	.L.Long	
EXPERIMENTAL VALUES	6:		1		
	т/к	Mol Fraction	Bunsen	Ostwald	
		$X_1 \times 10^4$	Coefficient × x 10 <sup>2</sup>	Coefficient L x 10 <sup>2</sup>	
	288.15 288.15	0.650	1.65 1.65	1.74 1.74	
	293.15	0.714	1.80	1.93	
	293.15	0.710	1.79	1.92	
	298.15 298.15 298.15	0.770 0.766 0.758	1.93 1.92 1.90	2.11 2.10 2.07	
	303.15	0.807	2.01	2.23	
	303.15	0.803	2.00	2.22	
Smoothed Data:	∆G <sup>o</sup> /J m	$ol^{-1} = -RT \ln 2$	$k_1 = 10,318 +$	44.260 T	
	Std. Dev	$\mathbf{v} \cdot \mathbf{\Delta} \mathbf{G}^{\mathbf{O}} = 25.0,$	Coef. Corr.	= 0.9946	
	For the the cri in benzo	recommended G tical evaluatio ene.	ibbs free ene on of the sol	rgy equation ubility of h	see elium
The solubility 101.325 kPa (1 Ostwald coeffic	values w atm) by b ient wer	ere adjusted to Henry's law. The calculated by	o a partial p he mole fract y the compile	ressure of h ion solubili r.	elium of ty and the
		AUXILIARY	INFORMATION		
METHOD:			SOURCE AND PUR	ITY OF MATERIAL	.S :
Gas absorption. The gas is presat- urated with solvent vapor. The gas volume absorbed is the difference		l. Helium. Containe neon.	Linde's Liqu d 0.5 per ce	id Air. nt by volume	
between initial and final gas vol- umes. The amount of solvent is deter- mined by the weight of mercury displaced.		2. Benzene. argewich point 5.	Kahlbaum, " tsbestimmung 48 <sup>O</sup> C.	zur Molekul- ". Melting	
APPARATUS/PROCEDURE: The apparatus is a		ESTIMATED ERROR:			
modification of (1). A calibrat manometer and b	that of ed, combined ulb is en	von Antropoff ined all glass nclosed in an		δT/K = 0.03	
air thermostat. the calibration The solvent is ratus. The solv shaken together established.	Mercury and con degassed ent and until ed	is used as fining liquid. in the appa- the gas are quilibrium is	REFERENCES: 1. v. Antro <u>Z</u> . <u>Elect</u>	poff, A. <u>rochem</u> . 1919	, <u>25</u> , 269.

COMPONENTS:	<u></u>	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-	-59-7	Clever, H.L. Saylor, J.	; Battino, R.; H.; Gross, P.M.	
2. Benzene; C <sub>6</sub> H <sub>6</sub> ; 71-43-2				
		J. Phys. Che	<u>m</u> . 1957, <u>61</u> , 1078 - 1083.	
VARIABLES:	- 31/ 95	PREPARED BY:	I. Long	
1/11. 200.13	514.55	-	. Le Long	
EVDEDIMENTAL MALHEC.				
T/I	K Mol Fraction	Bunsen Coefficient	Ostwald Coefficient	
	$x_1 \times 10^4$	∝x 10 <sup>2</sup>	$L \times 10^2$	
288	.15 0.655	1.68	1.77	
298.	.15 0.786	1.97	2.15	
314	,95 0.949	2.33	2.69	
Smoothed Data: $\triangle G^O$	$= - RT ln X_{1} = 10$	,242 + 44.422	T (J mol <sup>-1</sup> )	
Std.	Dev. $\Delta G^{O} = 51.2$ ,	Coef. Corr.	= 0.9964	
For t crit: in b	the recommended front fr	ee energy equ the solubili	ation see the ty of helium	
The solubility value 101.325 kPa (1 atm)	es were adjusted t by Henry's law.	o a partial p	ressure of helium of	
The Bunsen coefficer	nts were calculated	d by the comp	iler.	
1				
	AUXILIARY	INFORMATION		
METHOD: Volumetric. The wrated with gas as	he solvent is sat-	SOURCE AND PUR	ITY OF MATERIALS:	
an 8 mm x 180 cm gla	ass spiral attache	1. Helium. M	atheson Co. Both research	
to a gas buret.The t maintained at 1 atm	total pressure is as the gas is	no differ	ence in results.	
absorbed.	2	2. Benzene. Pittsburg water was and disti	Jones & Laughlin Steel Co. h, PA. Shaken with H <sub>2</sub> SO <sub>4</sub> , hed, dried over sodium, lled.	
APPARATUS/PROCEDURE: The	e apparatus is a	ESTIMATED ERRO	R:	
modification of that Billett (1) The mod	t of Morrison and		$\delta P/torr = 3$	
clude the addition of	of a spiral stor-		$S x_1 / x_1 = 0.03$	
age for the solvent a constant reference	, a manometer for e pressure, and an	REFERENCES :		
extra buret for high The solvent is dega	nly soluble gases. ssed by a modi-	1. Morrison, J. Chem.	T.J.; Billett, F. Soc. 1948, 2033;	
fication of the met	hod of Baldwin and	<u>1014</u> . 195	2, 3819.	
		2. Baldwin, J. Appl.	R.R.; Daniel, S.G. Chem. 1952, <u>2</u> , 161.	

COMPONENTS :			ORIGINAL MEASU	REMENTS:	
		de Wet, W.J	•	:	
1. Helium; He;	7440-59-	7			
2 Bonzenes C.H	71-43	-2			
z. benzene, c6n	6, 1, 43	2			
			J.S. Afr. C	<u>hem. Inst</u> . 1964	4, <u>17</u> , 9-13.
VARIABLES :			PREPARED BY:		
T/K: 29	1.75 - 3	05.15	Р	.L.Long	
	.01.325	(1 atm)			
EXPERIMENTAL VALUES	: <u> </u>				
	т7к	Mol Fraction	Bunsen	Ostwald	
		$x_{1} \times 10^{4}$	$\propto \times 10^2$	$L \times 10^2$	
	2014 75	0 607	1 76	1 00	
	291° 12	0.69/	1.70	1.00	
	299.15	0.759	1.90	2.08	
	305.15	0.837	2.08	2.32	
		. – 1			
Smoothed Data:	∆G <sup>O</sup> /J m	ol $= - RT ln$	$x_1 = 10,057$	+ 45.153 Т	
	Std. De	v. $\Delta G^{O} = 25.6$ ,	Coef. Corr.	= 0.9964	-
	For the	recommended fi	ree enerav ea	vation see the	
	critica	l evaluation of	the solubil	ity of helium	
	in benz	ene.			
The solubility	values w	ere adjusted to	o a partial p	ressure of hel	ium of
101.325 kPa (1	atm) by	Henry's law.			
The mole fracti	on solub	ility and the (	Ostwald coeff	icients were c	alculated
by the compiler	:.				
<u> </u>					
		AUXILIARY	INFORMATION		
METHOD: Volumet:	ric.		SOURCE AND PUR	ITY OF MATERIALS:	
To degas, the s	olvent is	placed in a	l. Helium.	No source give	n. The gas
large continous	ly evacua	ted bulb	purified	over activate	d charcoal
out further rele	ease of d	lissolved gases	at liqui	d air temperat	ure. Im-
		2	than 0.3	percent.	DE 1633
To saturate, the	e solvent	is flowed in	2. Benzene.	No source give	en. Benzene
containing the	ougn a gi mas. The	volume of	distille	d immediately	before use.
gas absorbed is	measured	l on an attach-			
ed buret system.	•				
			ESTIMATED ERRO	R:	
APPARATUS / PROCEDUR	E:		Derrantes billio	$\delta T/K = 0.05$	
The apparatus is	a modif	ication of		•	
that used by Mo	rrison an	nd Billett (1)			
and others (2).	The dega	assed solvent	REFERENCES		
through a glass	n gas as spiral c	ontaining the	KEPEKENCES:		
gas. The amount	t of solv	vent passed	1. Morrison	, T.J.; Billet	t, F.
through the spin	cal was s	such that 10 -	J. Chem.	50C. 1948, 20	; 55
25 ml of gas was	absorbe	ed.	<u></u>	52, 5017.	
			2. Clever,	H.L.; Battino,	R.;
			J. Phys.	, J.n.; Gross, Chem. 1957. 6	г.м. 1. 1078.

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СОМ	PONENTS :	EVALUATOR:	
1. 2.	Helium; He; 7440-59-7 Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ; 108-88-3	H. L. Clever Emory University Department of Chemistry Atlanta, Georgia 30322 USA	
		January 1978	

## CRITICAL EVALUATION:

The solubility of helium in toluene was measured by Saylor and Battino (1) and by de Wet (2). The two sets of data agree within 2.7 percent over 288 - 308 K, the temperature range of common measurement. The agreement is within the experimental uncertainty of the method used. The two sets of data have been combined on a one to one weight basis by the method of least squares in a Gibbs energy equation,  $\Delta G^\circ = A + BT$  (Table 1). The recommended thermodynamic values for the transfer of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 10,157 + 42.599 T$ Std. Dev.  $\Delta G^{\circ} = 47$ , Coef. Corr. = 0.9967  $\Delta H^{\circ}/J \mod^{-1} = 10,157$ ,  $\Delta S^{\circ}/J K^{-1} \mod^{-1} = -42.599$ 

The recommended mole fraction solubilities at 101.325 kPa (1 atm) and the Gibbs energy changes at five degree intervals are given in Table 2.

TABLE 1.	Parameters	for	the	Gibbs	energy	change	as	а	function	of	tempera-
	ture.										

$\Delta G^{\circ} = A + BT$	Std. Dev. $\Delta G^{\circ}$	No. Exp. Points	Weight	Reference
10,454 + 41.720 T 10,608 + 40.965 T 10,157 + 42.599 T	36.1 24.7 47.0	4 3 7	1 1	1 2 1 + 2

## TABLE 2. Recommended mole fraction solubility of helium in toluene at 101.325 kPa (1 atm).

т/к	Mol Fraction $X_1 \times 10^4$	∆G°/J mol <sup>-1</sup>
288.15	0.858	22,432
293.15	0.923	22,645
298.15	0.990	22,858-
303.15	1.059	23,071
308.15	1.13	23,284
313.15	1.20	23,497
318.15	1.28	23,710
323.15	1.36	23,923
328.15	1.44	24,136

Saylor, J. H.; Battino, R. J. Phys. Chem. 1958, 62, 1334.
 de Wet, W. H. J. S. Afr. Chem. Inst. 1964, 17, 9.

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COMPONENTS :	ORIGINAL MEASUREMENTS :	
1. Helium; He; 7440-59-7	Saylor, J. H.; Battino, R.	
2. Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ; 108-88-3		
	J. Phys. Chem. 1958, 62, 1334 - 1337.	
VARIABLES:	PREPARED BY .	
T/K: 288.15 - 328.15 P/kPa: 101.325 (1 atm)	H. L. Clever	
EXPERIMENTAL VALUES.		
	Dungen Octuald	
$\frac{x_1 \times 10^4}{x_1 \times 10^4}$	$\begin{array}{ccc} \text{Ostward} \\ \text{Coefficient} \\ \alpha \times 10^2 \\ \hline \end{array} \\ \begin{array}{c} \text{Ostward} \\ \text{L} \times 10^2 \\ \hline \end{array} \\ \end{array}$	
288.15 0.846	1.79 1.89	
298.15 0.981	2.05 2.24	
313.15 $1.17328.15$ $1.45$	2.42 2.77	
Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT$	$\ln x_1 = 10,454 + 41,720 \text{ T}$	
Std. Dev. $\Delta G^\circ = 36$	.1, Coef. Corr. = 0.9988	
For the recommended free energy equiparts solubility of helium in toluene.	uation see the critical evaluation of the	
The solubility values were adjuste 101.325 kPa (l atm) by Henry's law	d to a partial pressure of helium of	
The Bunsen coefficients were calcu	lated by the compiler.	
AUXILIARY INFORMATION		
METHOD: Wolumetric The solvent is sa	+- SOURCE AND PURITY OF MATERIALS:	
urated with gas as it flows through	h 1. Helium. Matheson Co., Inc.	
an 8 mm x 180 cm glass spiral at-	Research grade.	
tached to a gas buret. The total pressure is maintained at 1 atm as	a Dolyono Mollingkrodt Doogont	
the gas is absorbed.	grade. Shaken with conc. $H_2SO_A$ ,	
	water washed, dried over	
	Drierite, distilled b.p. 110.40 -	
	110.00 C.	
	ESTIMATED ERROR:	
APPARATUS/PROCEDURE: The apparatus is	$\delta T/K = 0.03$	
Billett (1). The modifications in-	$\delta P/torr = 1$	
clude the addition of a spiral sto	$ox_1/x_1 = 0.04$	
age for the solvent, a manometer f	or REFERENCES :	
extra buret for highly soluble gas	Ses.   Morrison T. J. Billett F	
The solvent is degassed by a modif	<u>i</u> - <u>J. Chem. Soc.</u> 1948, 2033;	
Daniel (2).	ibid. 1952, 3819.	
	2. Baldwin, R. R.; Daniel. S. G.	
	J. Appl. Chem. 1952, 2, 161.	

COMPONENTS :	ORIGINAL MEASUREMENTS:	
l. Helium; He; 7440-59-7	de Wet, W. J.	
2. Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ; 108-88-3		
	<u>J. S. Afr. Chem</u> . <u>Inst</u> . 1964, <u>17</u> , 9 - 13.	
VARIABLES:	PREPARED BY:	
T/K: 292.15 - 304.15	P.L. Long	
P/kPa: 101.325 (1 atm)		
EXPERIMENTAL VALUES:		
T/K Mol Fraction $X_1 \times 10^4$	Bunsen Ostwald Coefficient Coefficient α x 10 <sup>2</sup> L x 10 <sup>2</sup>	
292.15 0.924	1.95 2.09	
299.35 1.01	2.12 2.32	
304.15 1.10	2.29 2.55	
Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT \ln$	X <sub>1</sub> = 10,608 + 40.965 т	
Std. Dev. ∆G° = 24.7,	Coef. Corr. = 0.9951	
For the recommended free energy equat solubility of helium in toluene.	ion see the critical evaluation of the	
The solubility values were adjusted t 101.325 kPa (l atm) by Henry's law.	o a partial pressure of helium of	
The mole fraction solubility and the	Ostwald coefficients were calculated	
by the compiler.		
AUXILIARY INFORMATION		
METHOD: Volumetric.	SOURCE AND PURITY OF MATERIALS:	
To degas, the solvent was placed in	1 Holium No source given The gas	
until the solvent boiled freely with-	purified over activated charcoal	
out further release of dissolved	at liquid air temperature. Im-	
gases.	than 0.3 percent.	
To saturate, the solvent is flowed in		
containing the gas. The volume of	distilled immediately before use.	
gas absorbed is measured on an at-		
tached buret system.		
	ESTIMATED ERROR:	
The apparatus is a modification of	öτ/K = 0.05	
that used by Morrison and Billett (1)		
and others (2). The degassed solvent is saturated with gas as it flows		
through a glass spiral containing the	REFERENCES:	
gas. The amount of solvent passed through the spiral was such that	I. MOTRISON, T. J.; Billett, F. J. Chem. Soc. 1948. 2033:	
10-25 ml of gas was absorbed.	<u>ibid. 1952, 3819.</u>	
	2. Clever, H. L.; Battino, R.;	
	Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.	

COMPONENTS :	ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7	Byrne, J. E.; Battino, R.; Wilhelm, E.			
2. 1,2-Dimethylbenzene ( <u>o</u> -Xylene);				
C <sub>8</sub> H <sub>10</sub> ; 95-47-6	J. Chem. Thermodyn. 1975, 7, 515-522.			
VARIABLES:	PREPARED BY:			
т/к: 283.16 - 313.19	H. L. Clever			
P/kPa: 101.325 (1 atm)				
EXPERIMENTAL VALUES:	Bungon Ostvold			
T/K MOI Fraction	oefficient Coefficient			
	$\begin{array}{c} \alpha \times 10^2 \\ \end{array} \qquad \begin{array}{c} \text{L} \times 10^2 \\ \end{array}$			
283,16 0.758	1.42 1.474			
203.42 0.757 298.12 0.929	1.4/2 1.72 1.874			
	1.73 1.890			
313.09 1.111	2.03 2.324 2.01 2.300			
313.19 1.118	2.04 2.336			
Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$	$X_1 = 9508.0 + 45.305 T$			
Std. Dev. ΔG° = 10.4,	Coef. Corr. = 0.9999			
$\Delta H^{\circ}/J \text{ mol}^{-1} = 9508.0,$	$\Delta s^{o}/J K^{-1} mol^{-1} = -45.305$			
T/K Mol Fract X <sub>1</sub> x 10	ion ∆G°/J mol <sup>-⊥</sup> 4			
283.15 0.758	22,336			
288.15 0.813 293.15 0.870	22,563 22,789			
298.15 0.928	23,016			
303.15 0.989 308.15 1.05	23,242 23,469			
313.15 1.12	23,695			
<u>318.15</u> 1.18 The solubility values were adjusted to	23,922 o a partial pressure of helium of			
101.325 pKa (1 atm) by Henry's law. T	The Bunsen coefficients were calculated			
AUXILIARY	INFORMATION			
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:			
and the version used is described by	1. Helium. Either Air Products & Chemicals Inc., or Matheson Co.,			
Battino, Evans, and Danforth (2).	Inc. 99 mol % or better.			
	<ol> <li>1,2-Dimethylbenzene. Phillips Petroleum Co. Pure grade.</li> </ol>			
APPARATUS/PROCEDURE: Degassing. Up to				
500 cm <sup>3</sup> of solvent is placed in a flask of such size that the liquid is				
about 4 cm deep. The liquid is rapid-				
termittently through a liquid $N_2$ trap				
until the permanent gas residual	$\delta T/K = 0.03$			
Solubility Determination. The de-	$\delta P/mmHg = 0.5$			
gassed solvent is passed in a thin film down a glass spiral tube con-				
taining the solute gas and the	REFERENCES :			
solvent vapor at a total pressure of one atm. The volume of gas absorbed	1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033			
is found by difference between the initial and final volumes in the				
buret system. The solvent is collect-	2. Battino, R.; Evans, F. D.; Danforth, W. F.			
ed in a tared flask and weighed.	J. Am. Oil Chem. Soc. 1968, 45,			

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COMPONENTS:	EVALUATOR:
<ol> <li>Helium; He; 7440-59-7</li> <li>1,3-Dimethylbenzene (<u>m</u>-Xylene); C<sub>8</sub>H<sub>10</sub>; 108-38-3</li> </ol>	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	February 1978

## CRITICAL EVALUATION:

The solubility of helium in 1,3-dimethyl benzene was measured by de Wet (1) and by Byrne, Battino, and Wilhelm (2). The two sets of values differ by about 9 per cent over the 288 - 308 K temperature range of common measurement, with de Wet's data being the higher valued. The experimental technique used by the two laboratories is similar, and the gas and solvent appear to be of equivalent purity. Low solubility values could arise from either incomplete degassing, nonattainment of equilibrium, or both. High values could come from contamination of the helium in a more soluble gas. For the helium + 1,3-dimethylbenzene, there is no reason to favor one data set over the other. No recommendation of solubility values can be made without either further experimental work or a factor analysis of the noble gases' solubility in all solvents.

Table 1 gives the fit of the Gibbs energy equation,  $\Delta G^{\circ} = - RT \ln X_1 =$ A + BT, for each of the two data sets and for the combined data set. Table 2 gives the smoothed values of the mole fraction solubility at five degree intervals for the two data sets and the combined data set.

TABLE 1. Parameters for the Gibbs energy as a function of temperature.

$\Delta G^{\circ}/J \text{ mol}^{-1} = A + BT$	Std. Dev. ∆G°	No. Exp. Points	Reference	
9,982.5 + 42.848 T 10,057 + 41.914 T 9,975.8 + 42.684 T	31.5 36.3 100.	8 3 11	2 1	

TABLE 2. Comparison of smoothed mole fraction solubility data at 101.325 kPa (l atm).

т/к	Mole F	$raction/X_1 \times 10^4$	ł
,	Byrne, et al. (l)	de Wet (2)	Combined
283.15	0.832	-	0.844
288.15	0.896	0.973	0.916
293.15	0.962	1.04	0.988
298.15	1.03	1.12	1.06
303.15	1.10	1.20	1.13
308.13	1.17	1.28	1.20
313.15	1.25	-	1.27

1.

De Wet, W. J. <u>J. S. Afr. Chem. Inst.</u> 1964, <u>17</u>, 9. Byrne, J. E.; Battino, R.; Wilhelm, E. <u>J. Chem. Thermodyn</u>. 1975, <u>7</u>, 515. 2.

COMDONENTS .		
CONFONENTS:	ORIGINAL MEASUREMENTS:	
1. Helium; He;7440-59-7	de Wet, W. J.	
2. 1,3-Dimethylbenzene ( <u>m</u> -Xylene); C <sub>8</sub> H <sub>10</sub> ; 108-38-3		
	J. S. Afr. <u>Chem</u> . <u>Inst</u> . 1964, <u>17</u> , <u>9 - 13.</u>	
VARIABLES:	PREPARED BY:	
T/K: 291.35 - 304.75 P/kPa: 101.325 (1 atm)	P. L. Long	
EXPERIMENTAL VALUES:		
T/K Mol Fraction $X_1 \times 10^4$	BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$	
$\begin{array}{cccc} 291.35 & 1.01 \\ 298.95 & 1.15 \\ 304.75 & 1.21 \end{array}$	1.85 1.97 2.09 2.29 2.19 2.44	
Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT \ln 2$	K <sub>1</sub> = 10,057 + 41.914 T	
Std. Dev. ΔG° = 36.3,	Coef. Corr. = 0.9918	
For the recommended free energy equat: solubility of helium in m-xylene.	ion see the critical evaluation of the	
The solubility values were adjusted to 101.325 kPa (l atm) by Henry's law.	o a partial pressure of helium of	
The mole fraction solubility and the ( by the compiler.	Ostwald coefficients were calculated	
AUXILIARY INFORMATION		
METHOD: Volumetric.	SOURCE AND PURITY OF MATERIALS:	
To degas , the solvent is placed in a large continuously evacuated bulb until the solvent boils freely with- out further release of dissolved gases To saturate, the solvent is flowed in a thin film through a glass spiral	<ol> <li>Helium. No source given. The gas purified over activated charcoal at liquid air temperature. Im-</li> <li>purities estimated to be less than 0.3 percent.</li> <li>m-Xylene. No source given. m-</li> </ol>	
containing the gas. The volume of gas absorbed is measured on an attach- ed buret system.	fore use.	
APPARATUS/PROCEDURE:	ESTIMATED ERROR:	
The apparatus is a modification of that used by Morrison and Billett(1) and others (2). The degassed solvent is saturated with gas as it flows	δT/K = 0.05	
through a glass spiral containing the	REFERENCES :	
gas. The amount of solvent passed through the spiral was such that 10 - 25 ml of gas was absorbed.	<ol> <li>Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033. <u>ibid.1952, 3819.</u></li> </ol>	
	<ol> <li>Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.</li> </ol>	

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COMPONENTS:		ORIGINAL MEASUREMENTS:	
l. Helium; He	; 7440-59-7	Byrne, J. E.; Battino, R.; Wilhelm F	
<pre>2. 1,3-Dimethylbenzene (m-Xylene);     C<sub>8</sub>H<sub>10</sub>; 108-38-3</pre>			
		J. Chem. Thermodyn. 1975, 7, 515-522.	
VARIABLES:		PREPARED BY:	
т/к:	283.15 - 313.15	H. L. Clever	
P/kPa:	101.325 (1 atm)		
EXPERIMENTAL VALUE	S:		
-	T/K Mol Fraction	Bunsen Ostwald	
	$x_1 \times 10^4$	$\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \\ \hline \end{array}$	
	283.15 0.840	1.55 1.604	
	298.20 1.040	1.89 2.060	
	298.21 1.014	1.84 2.009	
	298.24 1.024 313 15 1 258	1.86 2.029 2.25 2.579	
	313.15 1.262	2.26 2.586	
Spoothed Data:	$\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$	$x_1 = 9,982.5 + 42.848$	
	Std. Dev. ∆G° = 31.5,	Coef. Corr. = 0.9979	
	$\Delta H^{\circ}/J \text{ mol}^{-1} = 9,982.5$	, $\Delta S^{\circ}/J K^{-1} mol^{-1} = 42.848$	
	T/K Mol Frac X <sub>l</sub> x l	tion \G°/J mol-1 0 <sup>4</sup>	
	283.15 0.83	2 22,115	
	288.15 0.89	6 22,329	
	293.15 0.96	2 22,543	
	303.15 1.10	22,972	
	308.15 1.17	23,186	
		23,400	
	AUXILIARY	INFORMATION	
METHOD: The app	aratus is based on the	SOURCE AND PURITY OF MATERIALS:	
and the versio	n used is described by	Chemicals, Inc. or Matheson Co.,	
Battino, Evans	, and Danforth (2).	Inc. 99 mole % or better.	
		2. m-Xylene, Phillips Petroleum	
The Bunsen and	Ostwald coefficients	Co., pure grade.	
	d by the compiler.		
APPARATUS / PROCE	DURE: Decassing Up to		
500 cm <sup>3</sup> of solv	vent is placed in a		
flask of such s	size that the liquid is		
about 4 cm deep	. The liquid is rapid-		
termittently th	rough a liquid N <sub>2</sub> trap	ESTIMATED ERROR:	
until the perma	nent gas residual	$\frac{\delta \Gamma}{M} = 0.03$	
pressure drops	to 5 microns.	$\delta X_1 / X_1 = 0.03$	
degassed solver	it passes in thin film		
down a glass spiral at a total		REFERENCES:	
solvent vapor.	solubility equilibrium	1. Morrison, T. J.; Billett, F.	
is rapidly atta	ained. The volume of	<u>J. Chem. Soc</u> . 1948, 2033.	
gas absorbed is	s measured, and the	2. Battino, R.; Evans, F. D.;	
flask and weigh	ied.	Danforth, W. F.	
		$\frac{J. Am}{830.}$ $\frac{O11}{Chem}$ Soc. 1968, 45,	

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7	Byrne, J. E.; Battino, R.; Wilhelm, E.
2. 1,4-Dimethylbenzene (p-Xylene); CgH10; 106-42-3	
0 10	J. Chem. Thermodyn. 1975, 7, 515-522.
T/K: 288.13 - 313.17	PREPARED BY: H. L. Clever
P/kPa: 101.325 (1 atm)	
EXPERIMENTAL VALUES:	
T/K Mol Fraction	Bunsen Ostwald Coefficient Coefficient
$x_1 \times 10^4$	$\alpha \times 10^2$ L × 10 <sup>2</sup>
288.13 0.922	1.68 1.777
298.17 0.901	1.90 2.074
298.13 1.076	1.95 2.125
298.13 1.051	1.90 2.074
298.15 1.072	1.94 2.117
	1.99 2.177 1 94 2 114
313.16 1.293	2.30 2.641
313.17 1.309	2.33 2.673
313.17 1.303	2.32 2.662
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$	$X_1 = 10500 + 40.830 T$
Std. Dev. ∆G° = 35.4,	Coef. Corr. = 0.9957
$\Delta H^{\circ} / T mol^{-1} = 10500$	$\Delta S^{\circ} / T K^{-1} mol^{-1} = -40.830$
	1000000000000000000000000000000000000
	The solubility
	values were adjus-
285.15 0.03	22,265 pressure of hel-
293.15 0.992	22,469 ium of 101.325 kPa
298.15 1.07	22,673 (1 atm) by Henry's
303.15 1.14 308.15 1.22	22,877 law. The Bunsen
313.15 1.31	23,286 calculated by the
318.15 1.39	23.490 carculated by the
	COUDCE AND DUDITY OF MATERIALS.
design by Morrison and Billett (1)	Source and Purify of Malerials;
and the version used is described by	Chemicals. Inc., or Matheson Co.
Battino, Evans, and Danforth (2).	Inc. 99 mol % or better.
	<ol> <li>1,4-Dimethylbenzene. Phillips Petroleum Co., pure grade.</li> </ol>
ADDADATUS /DDOCEDUDE . Docadaina Un to	
500 cm <sup>3</sup> of solvent is placed in a	
flask of such size that the liquid is	
about 4 cm deep. The liquid is rapid-	
ly stirred, and vacuum is applied in-	
until the permanent gas residual	ESTIMATED ERROR:
pressure drops to 5 microns.	$\delta T/K = 0.03$
Solubility Determination. The de-	$\delta r / num g = 0.5$ $\delta x_1 / x_1 = 0.03$
gassed solvent passes in a thin film	0TT
the solute gas plus the solvent vapor	REFERENCES:
at a total pressure of one atm. The	1. Morrison, T. J.; Billett, F.
volume of gas absorbed is found by	<u>J. Chem. Soc</u> . 1948, 2033.
difference between the initial and	2. Battino, R.: Evans, F. D.:
The solvent is collected in a tared	Danforth, W. F.
flask and weighed.	J. Am. Oil Chem. Soc. 1968, 45,
	830.

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COMPONENTS:	ORIGINAL MEASUREMENTS:			
1. Helium: He: 7440-59-7	Lannung, A.			
2. Methanol; CH <sub>4</sub> O; 67-56-1				
	<u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68 - 80.			
VARIABLES:	PREPARED BY:			
1/K: 200.15 = 503.15	P.L.Long			
P/KPa: 101.325 (1 atm)				
EXPERIMENTAL VALUES:				
T/K Mol Fraction X <sub>1</sub> x 10 <sup>4</sup> Co	BunsenOstwaldbefficientCoefficient $\mathbf{x} \times 10^2$ L x 10^2			
288.15 0.533	2.97 3.13			
288.15 0.535	2.98 3.14			
293.15 0.564	3.12 3.35 3.14 3.37			
298.15 0.594	3.27 3.57			
303.15 0.625	3.42 3.80			
Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln$	$X_1 = 7591.9 + 55.436 T$			
Std. Dev. $\Delta G^{O} = 6.3$ ,	Coef. Corr. = 0.9998			
$\Delta H^{O}/J \text{ mol}^{-1} = 7591.9,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -55.436$			
T/K Mol Fra X <sub>1</sub> x	action $\Delta G^{O}/J \text{ mol}^{-1}$ 10 <sup>4</sup>			
288.15 0.5	23,566			
	564 23,843 595 24 120			
303.15 0.0	525 24,397			
The Ostwald coefficients and the mole calculated by the compiler.	e fraction solubilities of helium were			
Clever and Reddy (2) report a Bunsen $0.618 \times 10^{-4}$ ) at 303.15 K and 101.32	coefficient of 3.38 x $10^{-2}$ (X <sub>1</sub> = 5 kPa. Value not used in smoothed fit.			
AUXILIARY	INFORMATION			
METHOD:	SOURCE AND PURITY OF MATERIALS:			
One observation who use is proport	l. Helium, Linde Liquid Air Factory.			
urated with solvent vapor. The gas volume absorbed is the difference	Contained 0.5 per cent by volume neon.			
umes.The amount of solvent is deter-	2. Methanol. B.A.S.F. Distilled from			
mined by the weight of mercury displaced.	freshly cut strips of mag- nesium metal. The first one-third was discarded.			
	OTHER DATA: Popov and Drakin report(3)			
	the apparent partial molal volume of He in $CH_3OH$ as $35.3 \pm 0.6 \text{ cm}^3 \text{ mol}^{-1}$ .			
APPARATUS/PROCEDURE: The apparatus is a	ESTIMATED ERROR: $\delta T/K = 0.03$			
modification of that of von Antropoff				
(1). A callbrated combined all glass manometer and bulb is enclosed in an				
air thermostat. Mercury is used as	REFERENCES:			
The solvent is degassed in the appa-	1. von Antropoff, A.			
ratus. The solvent and the gas are	Z. Elektrochem. 1919, 25, 269.			
established.	2. Clever, H.L.; Reddy, G.S. J. Chem. Eng. Data 1963 8, 191			
	3. Popov. G.A.: Drakin. S.T.			
	Zh. Fiz. Khim. 1974, 48, 631.			

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COMPONENTS:		EVA	LUATOR:		
<ol> <li>Helium;</li> <li>Ethanol 64-17-5</li> </ol>	He; 7440-59-7 (Ethyl Alcohol);	н с ; с <sub>2</sub> н <sub>6</sub> о; А и	. L. Clever hemistry Departm mory University tlanta, Georgia SA	ent 30322	
		F	ebruary 1978		
CRITICAL EVALUA	TION:	······			
The solu Cargill (2) and 303 K. of the mole at 303 K.	ubility of helium There is a 15 Over that temper fraction solubi	n in ethanol degree range cature range Lities from 0	was measured by of common measu there is an incr .9 per cent at 2	Lannung (1) an rement between easing diverge 88 to 5.8 perc	d by 288 ence ent
The held used by Caro either of th	ium gas used by 1 gill contained 0 nese impurities v	Lannung conta .71 weight pe vas made.	ined 0.5 percent rcent water. No	neon. The et correction fo	hanol or
Table l linear tempe	gives details on erature function	n the least s for the two	quares fit of th data sets and th	e Gibbs energy eir combinatio	to a on.
TABLE 1. Pa	arameters for $\Delta G^{i}$	° = A + BT			
∆G°∕J mo	$1^{-1} = A + BT$	Std. Dev. ∆G	° No. Exp. Po	ints Weight	Ref
7,250.9 - 9,791.5 - 9,866.8 -	+ 54.434 T + 45.547 T + 45.428 T	19.3 79.1 80.0	6 6 12	1 1	1 2
Table 2 compares the mole fraction solubility of helium in ethanol at 101.325 kPa (1 atm) from the three equations at five degree intervals. The Gibbs energy values in Table 2 are for the combined fit. TABLE 2. Calculated mole fraction solubility of helium in ethanol at 101.325 kPa (1 atm).					
т/к	Mol 1	Fraction/X1 x	104	∆G°/J mol <sup>-1</sup>	
	Lannung (1)	Cargill (2)	Combined		
278.15	-	0.605	0.594	22,503	
288.15	0.695	0.701	0.689	22,957	
293.15	0.732	0.752	0.740	23,184	
298.15	0.770	0.804	0.791	23,411	
303.15	0.808	0.858 0 91 <i>4</i>	0.845	23,638 23 866	
313.15	-	0.972	0.958	24.093	
318.15	-	1.030	1.015	24,320	
323.15	-	1.090	1.075	24,547	
328.15	-	1.220	1.140	24,//4 25,001	

This is an important system which needs more work before solubility values can be recommended. A tentative acceptance of the combined data is recommended with

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 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 9,886.8 + 45.428 T$ 

Std. Dev. ∆G° = 80.0, Coef. Corr. = 0.9934

$$\Delta H^{\circ}/J \text{ mol}^{-1} = 9,866.8, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -45.428$$

Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
 Cargill, R. W. J. Chem. Soc., Faraday Trans. 1. 1978, 74, 1444.

COMPONENTS:	01	RIGINAL MEAS	UREMENTS:		
l. Helium; He; 7440-59-7	:	Lannung, A	•		
2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O; 64-17-5					
		<u>J. Am. Che</u>	<u>em. Soc</u> . 1930, <u>52</u> , 68 - 80.		
VARIABLES:	P	PREPARED BY:			
T/K: 288.15 - 303 P/kPa: 101.325	.15 (1 atm)	P. L. Long			
EXPERIMENTAL VALUES:					
T/K Mol	Fraction Con x 10 <sup>4</sup>	Bunsen efficient α x 10 <sup>2</sup>	Ostwald Coefficient L x 10 <sup>2</sup>		
288.15 288.15 293.15 293.15 303.15 303.15	0.699 0.689 0.732 0.737 0.800 0.914	2.70 2.66 2.81 2.83 3.04	2.85 2.81 3.02 3.04 3.37		
The mol fraction and Ostwald solubilities were calculated by the compiler. See the evaluation of the solubility of helium in ethanol for the recommen- ded solubility equation. The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.					
	AUXILIARY IN	FORMATION			
METHOD: Gas absorption. The gas is rated with solvent vapor. volume absorbed is the diff between initial and final of umes. The amount of solven termined by the weight of a displaced.	s presatu- The gas ference gas vol- nt is de- mercury	OURCE AND PU 1. Helium Contai neon. 2. Ethanc dan.), freshl	DRITY OF MATERIALS: a. Linde's Liquid Air. and 0.5 percent by volume bl. (Alcohol absolutus, Ph. distilled twice from over y prepared quick lime.		
	E	STIMATED ER	ROR:		

COMPONENTS:			ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7			Cargill, R. W.			
2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O; 64-17-5			J. <u>Chem. Soc.</u> , <u>Faraday</u> <u>Trans. 1</u> . 1978, <u>74</u> , 1444 - 1456.			
WADTADI EC.						
T/K: 2 P/kPa:	78.85 - 333. 101.325 (1	15 atm)	PREPARED BY: H. L. Clever			
EXPERIMENTAL VALUES	5:				·	
Т/К	Solubility*	Mol Fracti	on	Bunsen	Ostwald	-
	cm <sup>3</sup> kg <sup>-1</sup>	X <sub>1</sub> x 10 <sup>4</sup>		Coefficient α x 10 <sup>2</sup>	Coefficient L x 10 <sup>2</sup>	
278.15	30.5	0.627		2.45	2.50	
289.15	34.8	0.715		2.76	2.92	
299.15	38.4	0.789		3.01	3.30	
320.15	50.4	1.035		3.86	4.52	
333.15	61.5	1.265		4.64	5.66	
* Gas volume at	273.15 K an	d l atm in	1.0	000 kg ethano	1.	
Smoothed Data:	∆G°/J mol <sup>-1</sup>	= - RT ln	x <sub>1</sub> =	= 9 <b>,</b> 791.5 + 4	5.547 т	
	Std. Dev. $\Delta$	G° = 79.1,	Coe	ef. Corr. = 0	.9963	
The mole fraction, Bunsen and Ostwald coefficients were calc compiler. See the evaluation of the solubility of helium in ethanol fo ded free energy equation.					e calculated	by the recommen-
		AUXI LI ARY	INFOF	RMATION		
METHOD: Modified apparatus (1) addition of a c measuring the m (instead of vol ance. Each det 20 cm <sup>3</sup> of gas i solvent. The s using the vapor	Morrison an modification onstant flow ass of the s ume) on a t ermination u n up to 500 olvent was d -pump princi	d Billett ns include pump, and olvent op-pan bal- sed about cm <sup>3</sup> of egassed ple (1).	SOUR 1. 2.	CE AND PURITY C Helium. Ethanol. S tained 1.8 water.	OF MATERIALS: Ource not giv mol % (0.71 v	ven. Con- weight %)
APPARATUS / PROCEDUR	F. •	<u> </u>	ESTI	MATED ERROR:		
APPARATUS/PROCEDUR	E:					
			REFE	RENCES:		
			1.	Morrison, T. J. <u>Chem. Soc</u> <u>ibid</u> . 1952,	J.; Billett, . 1948, 2033 3819.	, F.

COMPONENTS:	ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7	Battino, R.; Evans, F. D.; Danforth, W. F.; Wilhelm, E.			
2. 2-Methyl-l-propanol; $C_{4}H_{10}O;$				
70-03-1	<u>J. Chem</u> . <u>Thermodyn</u> . 1971, <u>3</u> , 743-751.			
VARIABLES:	PREPARED BY:			
т/к: 274.02 - 312.76	H. L. Clever			
P/kPa: 101.325 (1 atm)				
EXPERIMENTAL VALUES:				
T/K Mol Fraction	Bunsen Ostwald			
x <sub>1</sub> x 10 <sup>4</sup>	$\alpha \ge 10^2$ L $\ge 10^2$			
274.02 0.87	2.15 2.16			
282.91 0.89	2.17 2.25			
295.85 1.00	2.43 2.63			
312.76 1.12	2.66 3.05			
Smoothed Data: $\Delta G^2 = -\kappa T \ln x_1 = 49$ .	L/.J T J7.730 I			
Std. Dev. ΔG° = 43.8,	Coef. Corr. = 0.9991			
$\Delta H^{\circ}/J \text{ mol}^{-1} = 4917.5,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -59.956$			
, T/K Mol Fract $X_1 \times 10^{-1}$	tion ∆G°/J mol <sup>-1</sup> )4			
273.15 0.84	7 21.294			
278.15 0.88	1 21,594			
283.15 0.91	4 21,894			
288.15 0.94	8 22,194			
	2 22,494			
	22,793			
308 15 1 08	23,393			
313.15 1.12	23,693			
The solubility values were adjusted to	o a partial pressure of helium of			
101.325 kPa (1 atm) by Henry's law.	ed by the compiler.			
AUXILIARI				
METHOD: A. Degasser (1). B. Absorp-	SOURCE AND PURITY OF MATERIALS;			
(2, 3).	<ol> <li>Helium. The Matheson Co., Inc. greater than 99 mol %.</li> </ol>			
	2. 2-Methyl-l-propanol. Fisher Scientific Co., certified (99 mol %).			
APPARATUS/PROCEDURE: Degassing.				
The solvent is sprayed into an evacu-				
tus. it is stirred and heated until	ESTIMATED ERROR:			
the pressure drops to the vapor	$\delta T/K = 0.03$			
pressure of the liquid. Solubility	$\frac{\delta r}{\hbar m m r} = 0.03$			
Determination. The degassed liquid				
passes in a thin film down a glass	REFERENCES:			
spiral tube at a total pressure of	1. Battino, R.; Evans, D. F.			
vapor. The gas absorbed is measured	Anal. Chem. 1966, <u>38</u> , 1627.			
in the attached buret system, and the	4. Morrison, T. J.;Billett, F.			
solvent is collected in a tared flask	J. Chem. Soc. 1948, 2033.			
and weighed.	Savlor, J. H. Gross P. M.			
	J. Phys. Chem. 1957, 61, 1078.			

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COMPONENTS:	ORIGINAL MEASUREMENTS:					
1 Helium. He. 7440-50-7	Wilcock, R.S.: Battino, R.:					
T. HETTUM, HE; /440-55-7	Danforth, W.F; Wilhelm, E.					
2. 1-Octanol; C <sub>8</sub> H <sub>18</sub> O; 111-87-5	T Cherry Theory 1079 10 017-022					
	J. <u>Chem</u> . <u>Thermodyn</u> . 1978, <u>10</u> , 817-822.					
VARIABLES:	PREPARED BY:					
T/K: 282.45 - 298.17	A.L. Cramer					
P/kPa: 101.325 (1 atm)						
EXPERIMENTAL VALUES:						
T/K Mol Fraction	Bunsen Ostwald					
	Coefficient Coefficient					
$x_1 \times 10^4$	α x 10 <sup>2</sup> L x 10 <sup>2</sup>					
$\frac{-1}{282.45}$ $\frac{1}{1.105}$	1 585 1 639					
298.17 1.207	1.709 1.866					
Smoothed Data: $\Delta G'/J \text{ mol}^{-1} = -RT \ln 2$	$x_1 = 3932.8 + 61.823 T$					
$\Delta H^{O} J mol^{-1} = 3932.8,$	$\Delta s^{o}/J \kappa^{-1} mol^{-1} = -61.823$					
	1 + i = 1 + 1 + 1 + 1					
T/K MOI Fra						
<u></u>						
283.15 1.1	LO 21,438					
	42   21,747   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   22.056   75   75   75   75   75   75   75					
298.15 1.2	22,365					
The colubility values were adjusted to a partial prossure of bolium of						
101.325 kPa by Henry's law.						
The Bunsen coefficients were calculated by the compiler.						
$\{C.R.\}, 4th 1975, 6, 122-128; Chem.Ab$	A preliminary report of this work appeared in <u>Conf. Int. Thermodyn. Chim.</u> , {C.R.}, 4th 1975, 6, 122-128: Chem.Abstr. 1977, 86, 22375d.					
AUXILIARY	INFORMATION					
METHOD / APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS					
The apparatus is based on the de-	1. Helium. Matheson Co. Inc.					
sign of Morrison and Billett (1), and	Purest commercially available					
the version used is described by	grade.					
degassing apparatus and procedure are	2. 1-Octanol. Eastman Organic					
described by Battino, Banzhof, Bogan,	Chemicals. Distilled.					
See the helium + octane data sheet						
for more details.						
	ESTIMATED ERROR:					
	$\delta T/K = 0.03$					
	$\delta P/mmHg = 0.5$ $\delta X_{-}/X_{-} = 0.02$					
	REFERENCES :					
	1.Morrison, T.J.; Billett, F.					
	2.Battino,R.;Evans,F.D.;Danforth.W.F.					
	J.Am.Oil Chem. Soc. 1968, 45, 830.					
	3.Battino,R.;Banzhof,M.;Bogan,M.; Wilhelm,E.					
1	Anal. Chem. 1971, 43, 806.					

COMPONENTS:	ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7	Wilcock, R.J.; Battino, R.;			
2. 1-Decanol: C. H. O: 112-30-1	Danforth, W.F; Wilhelm, E.			
$10^{10}20^{11}$	J.Chem.Thermodyn. 1978, 10, 817-822.			
VARIABLES:	PREPARED BY:			
T/K: 282.64 - 313.49	A.L. Cramer			
P/kPa: 101.325 (1 atm)				
EXPERIMENTAL VALUES.				
TV Mol Eraction	Bungon Ostwald			
	Coefficient Coefficient			
$x_{-} \times 10^{4}$	$\alpha \times 10^2$ L $\times 10^2$			
282.64 1.338				
313.49 1.736	2.006 2.302			
Smoothed Data: $\Delta G^{\circ}/J \mod 1 = -RT \ln 3$	$\zeta_1 = 6230.2 + 52.158 \text{ T}$			
Std. Dev. $\Delta G^{\circ} = 22$ , Co	oef. Corr. = 0.9996			
$AH^{O}J mol^{-1} = 6230.2.7$	$S^{0}/I K^{-1} mol^{-1} = 52.158$			
T/K Mol Frac	ction $\Delta G^{O}/J \text{ mol}^{-1}$			
x <sub>1</sub> x 1	L0 <sup>4</sup>			
	20.999			
288.15 1.40	20,999			
293.15 1.40	54 21,520			
	28 21,780			
308.15 1.65	58 22,303			
313.15 1.72	23 22,563			
The solubility values were adjusted to a partial pressure of bolium of				
101.325 kPa by Henry's law.	o a partiar pressure or meriam or			
The Bunsen coefficients were calculate	ed by the compiler.			
AUXILIARY	INFORMATION			
METHOD / APPARATUS / PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The apparatus is based on the de-	1. Helium. Matheson Co. Inc.			
the version used is described by	grade.			
Battino, Evans, and Danforth (2).	92440.			
The degassing apparatus and procedure	2. 1-Decanol. Eastman Organic			
are described by Battino, Banzhof, Bogan and Wilhelm (3)	Chemicals. Distilled.			
See the helium + octane data sheet				
for more details.				
A preliminary report of this work				
appeared in Conf. Int. Thermodyn.				
Chim., {C.R.}, 4th, 1975, 6, 122-128;	ESTIMATED ERROR: $\delta \pi / \kappa = 0.03$			
<u>Chem</u> . <u>Abstr</u> . 1977, <u>86</u> , 22375d.	$\delta P/mmHg = 0.5$			
	$\delta x_{1}^{\prime} / x_{1}^{\prime} = 0.02$			
	REFERENCES:			
	J. Chem. Soc. 1948. 2033.			
	2.Battino,R.;Evans,F.D.;Danforth,W.F.			
	J.Am.Oil Chem. Soc. 1968, <u>45</u> , 830.			
	<pre>S.Battino, K.; Banznor, M.; Bogan, M.; Wilhelm, E.</pre>			
	<u>Anal. Chem</u> . 1971, <u>43</u> , 806.			

COMPONENTS :	· · · · · · · · · · · · · · · · · · ·			ORIGINAL	MEASURE	MENTS:		
1. Helium; He; 7440-59-7			Lannung, A.					
2. Cyclohexanol; C <sub>6</sub> H <sub>12</sub> O; 108-93-0							i	
			01	a	- 2	co oo		
				<u>J. Am</u> .	Chem.	<u>Soc</u> . 1930	, <u>52</u> ,	68 - 80.
VARIABLES:				PREPARED	BY:		<u>.                                    </u>	
T/K: 2 He P/kl	298.15 -	310.15 325 (1 a	atm)		Ρ.	L. Long		
EXPERIMENTAL VALUE	S:	N-1 - 7				Ostusld	<b>_</b> .	
	Τ/K	x <sub>1</sub> x	4 0 10	Bunsen Coeffici α x 10	ent Co 2	Defficient L x 10 <sup>2</sup>		
	298.15	0.4	468	0.99		1.08		
	298.15	0.4	482	1.02		1.11		
	303.15	0.9	532	1.12		1.24		
	310.15	0.	558 578	1.17		1.33		
- Smoothed Data:	ΔG°/J :	mol <sup>-1</sup> =	- RT ln	$x_1 = 11$	.532 +	44.122 T		
	Std. D	ev. ∆G°	= 84.9,	Coef.	Corr. =	= 0.9418		
	∆H°/J n	$mol^{-1} =$	11,532,	∆S⁰/J 1	K-l mol	$1^{-1} = -44.1$	L <b>22</b>	
	<u>'</u>	г/к м	101 Fract	ijon ∆G	°/J mo]			
	_		x <sub>1</sub> x 10	4				
	2	98.15	0.473	-	24,687			
	3	08.15	0.550		25,128			
	3	13.15	0.591		25,349			
The mole fract	tion solu	ubility	and the	Ostwald	coeffi	cients wer	e cal	culated
by the compile	er.							
			AUXILIARY	INFORMATI	ON			
METHOD:	_			SOURCE AL	ND PURIT	Y OF MATERIA	LS;	
Gas absorption	. The g	as is pa or. The	resatu-	1. He Co	lium. ntained	Linde's L: 10.5 per (	iquid cent l	Air. ov volume
volume absorbed	d is the	differ	ence	ne	on.	·····		1
between initia umes. The amo	l and fi unt of s	nal gas olvent	vol- is deter·	2. Cv	clohexa	anol. "pu	r". Po	oulenc
mined by the w	eight of	mercur	Y STORE	Freres, fractionated twice in				
displaced.				$\frac{vacuo}{23.6}$ - 23.9 °C.				
	р. <u>Ш</u>			ESTIMATE	D ERROR:			
modification of	E: The a f that o	pparatu f von A	s is a ntropoff		ć	ST/K = 0.03	3	
(1). A calibra	ted, com	bined a	ll glass					
air thermostat	. Mercur	y is us	ed as					
the calibration	n and co	nfining	liquid.	REFERENC	ES:	ff. D		
ratus. The sol	vent and	the ga	s are	<u>Z</u> . <u>E</u>	lectro	<u>chem</u> . 1919	, <u>25</u> ,	269.
shaken togethe	r until	equilib	rium is					
l								

COMPONENTS					
		ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7		Lannung, A.			
<pre>2. 2-Propanone (Acetone); C<sub>3</sub>H<sub>6</sub>O; 67-64-1</pre>					
		<u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68 - 80.			
VARIABLES:		PREPARED BY:			
т/к: 28	88.15 <b>-</b> 298.15	P. L. Long			
He P/kPa	a: 101.325 (1 atm)				
EXPERIMENTAL VALUE	S:				
- Smoothed Data:	T/K Mol Fraction $\frac{X_1 \times 10^4}{288.15}$ $\frac{X_1 \times 10^4}{0.907}$ $\frac{288.15}{288.15}$ $\frac{0.927}{288.15}$ $\frac{0.924}{293.15}$ $\frac{0.966}{293.15}$ $\frac{1.01}{293.15}$ $\frac{1.01}{298.15}$ $\frac{1.01}{1.09}$ $\frac{298.15}{1.09}$ $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT \ln$ Std. Dev. $\Delta G^{\circ} = 43.6$	Bunsen         Ostwald           Coefficient         Coefficient $\alpha \times 10^2$ L $\times 10^2$ 2.79         2.94           2.85         3.01           2.84         3.00           2.95         3.17           3.10         3.33           3.09         3.32           3.19         3.48           3.32         3.62           3.31         3.61			
	$\Delta H^{0}/J \text{ mol}^{-1} = 11,277,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -38.143$			
The mole fract	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	tion $\Delta G^{\circ}/J \text{ mol}^{-1}$ 9 22,268 6 22,459 5 22,650 Ostwald coefficients were calculated			
	AUXILIARY	INFORMATION			
METHOD: Gas absorption. rated with solv volume absorbed between initial umes. The amou mined by the we displaced.	. The gas is presatu- vent vapor. The gas d is the difference l and final gas vol- unt of solvent is deter eight of mercury	<ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>Helium. Linde's Liquid Air. Contained 0.5 percent by volume neon.</li> <li>Acetone. Kahlbaum's "zur Analyse". Used after tests showed absence of water, acid and aldehyde.</li> </ul>			
APPARATUS/PROCEDUR modification of (1). A calibra manometer and h air thermostat. the calibration The solvent is ratus. The sol shaken together established.	E: The apparatus is a that of von Antropoff ated, combined all glas bulb is enclosed in an . Mercury is used as h and confining liquid. degassed in the appa- lvent and the gas are r until equilibrium is	ESTIMATED ERROR: $\delta T/K = 0.03$ REFERENCES: 1. v. Antropoff, A. <u>Z. Electrochem</u> . 1919, <u>25</u> , 269.			

COMPONENTS:			ORIGINAL MEASUREMENTS:			
l. Helium; He; 7440-59-7			Kobatake, Y.; Hildebrand, J.H.			
<pre>2. Hexadecafluoroheptane; C<sub>7</sub>F<sub>16</sub>; 335-57-9</pre>						
			J. Phys	s. <u>Chem</u> . 19	61, <u>65</u> , 331 - 335.	
VARIABLES:			PREPARED	BY:		
T/K: 29 He P/kPa:	91.40 - 303.23 101.325 (1 atm)		(	C.E.Edelman	, M.E.Derrick	
EXPERIMENTAL VALUE	S:					
-	T/K Mol Fra	ction	Bunsen	Ostw	ald	
	x <sub>1</sub> x	10 <sup>4</sup> C	oefficie ∝ x 10	2 Coeffi L x	cient 10 <sup>2</sup>	
	291.40 8.31	4 -	8.29	8.8	5	
	295.47 8.58	1	8.50	9.2	0	
	303.23 9.29	4	9.10	10.1	0	
-	AC <sup>0</sup> /T mal <sup>-1</sup>	- 1 חת	V. – 71		4.2m	
Smootned Data:		- KT IN	$x_1 = /12$	24.4 + 34.5	451	
	Std. Dev. AGO	= 11.3,	Coef. (	corr. = 0.9	979	
	$\Delta H^{O}/J \text{ mol}^{-1} = 0$	7124.4,	∆s°/J i	$K^{-1} mol^{-1} =$	-34.543	
	т/к	Mol Frac X <sub>l</sub> x l	tion 4	G <sup>O</sup> /J mol <sup>-1</sup>		
	288.15	8.02		17,078	_	
	293.15	8.44	17,251			
	303.15	9.29		17,596		
The solubility 101.325 kPa (1 The Bunsen and	values were ad atm) by Henry's Ostwald coeffic	justed t s law. cients w	o a part ere calc	tial pressu	- re of helium of the compiler.	
	A	UXILIARY	INFORMATI	ON		
METHOD: The appar	atus consists of	Fa gas	SOURCE A	ND PURITY OF	MATERIALS:	
measuring buret and reservoir f	, an absorption for solvent with	pipet, suitabl	1. Hel: e 99.9	ium. Linde ( 9 per cent.	Oxygen Co. Purity	
at 25 °C, the p	ne buret is therm Dipet at any temp	nostated perature	2 Hove	adecafluoro	hentane Source not	
from 5 to 30 °C	. The pipet cont	tains a	given. Purified as described in			
glass-enclosed vide gentle. co	piece of iron to ntinuous magnet:	o pro- ic stir-	refe	erence 1.		
ring. Pure sol	vent is degassed	l by				
uating. then bo	iquid nitrogen,	evac- at lamp.				
The degassing p	process is repeat	ted				
into the pipet.	e soivent is the where it is again	en tlowe ain boil	n 			
ed under low pr	ed under low pressure for final de-			D EKKOR:		
gassing. Manipulation of the apparatus is such that the solvent never comes						
in contact with	stopcock grease	e. The		TT. 0100		
mercury. Its vo	olume is the diff	ference	REFERENC	CES:		
between the cap	acity of the pip	pet and	1. Glev	w, D.N.; Re	eves, L.W.	
it. Gas is admi	itted to the pipe	et. Its	<u>-</u>	Phys. Chem.	1956, <u>60</u> , 615.	
exact amount is	determined by I	P-V	[			
after introduct	i the buret befor ion of gas into	the				
pipet. The stir	rer is set in mo	otion.				
measurements in after introduct pipet. The stir Equilibrium is						
COMPONENTS:	ORIGINAL MEASUREMENTS:					
--	--	--	--	--		
1. Helium; He; 7440-59-7	Clever, H. L.; Saylor, J. H.;					
<ol> <li>Undecafluoro(trifluoromethyl)-</li> </ol>	GIOSS, F. M.					
cyclohexane (Perfluoromethyl-						
cyclohexane); C <sub>7</sub> F <sub>14</sub> ; 355-02-2						
/ 14	J. Phys. Chem. 1958, 62, 89-91.					
VARIABLES:						
π/κ: 289.15 - 316.25	PREPARED BY: P. L. Long					
$P(1, R_{1}, 1, 0) = 225 (1, 1, 1, 1)$						
P/KPA: 101.325 (1 atm)						
T/K Mol Fraction	Bunsen Ostwald					
	Coefficient Coefficient					
$X_{1} \times 10^{4}$	$\alpha \times 10^2$ L x $10^2$					
289.15 7.05	8.17 8.65					
316.25 8.23	9.16 10.6					
Smoothed Data: $\Delta G^{\circ}/J \mod 1 = - RT \ln$	$x_1 = 4336.5 + 45.274 \text{ T}$					
Std. Dev. $\Lambda G^{\circ} = 35.0$	Coef. Corr. = $0.9984$					
$\Delta H^{\circ}/J \text{ mol}^{-1} = 4336.5,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -45.274$					
T/K Mol Fract	Lion ∆G°/J mol <sup>⊥</sup>					
	J•					
288,15 7,06	17.382					
293.15 7.28	17,609					
298.15 7.51	17,835					
303.15 7.73	18,061					
308.15 7.94	18,288					
	18,514					
	10,741					
The solubility values were adjusted to a partial pressure of helium of						
101.325 kPa (1 atm) by Henry's law.						
The Bunsen coefficients were calculate	ed by the compiler.					
AUXILIARY	INFORMATION					
METHOD: Volumetric (1) The apparatus	SOURCE AND DURITY OF MATERIALS.					
is a modification of that used by	1. Helium. Matheson Co., Inc. Both					
Morrison and Billett (2). Modifica-	standard and research grades					
tions include the addition of a	were used.					
spiral solvent storage tubing, a						
manometer for constant reference	2. Perfluoromethylcyclohexane.					
pressure, and an extra gas buret for	du Pont FCS-326, shaken with					
highly soluble gases.	dried over Drierife and distilled					
	b.p. 75.95 to 76.05° at 753 mm.,					
	lit. b.p. 76.14 °C at 760 mmHg.					
	ESTIMATED ERROR:					
AFPARATUS/PROCEDURE: (a) Degassing, 700ml	δπ/Κ = 0.05					
or sorvent is snaken and evacuated while attached to a cold tran until	$\delta P/mm Hq = 3$					
no bubbles are seen: solvent is then	$\delta x_1 / x_1 = 0.03$					
transferred through a 1 mm. capillary	± ±					
tubing, released as a fine mist into	REFERENCES:					
a continuously evacuated flask.	1. Clever, H. J.; Battino, R.;					
(b) Solvent is saturated with gas as	Saylor, J. H.; Gross, P. M. J. Phys. Chom. 1957, 61, 1079					
tubing attached to a gas burst Pros-	<u>. 10/8. Chem</u> . 1957, <u>01</u> , 10/8.					
sure is maintained at 1 atm as the	2. Morrison, T. J.; Billett, F.					
gas is absorbed.	J. Chem. Soc. 1948, 2033;					
	ibid.1952, 3819.					

COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Evans, F. D.; Battino, R.		
2. Hexafluorobenzene; C <sub>6</sub> F <sub>6</sub> ; 392-56-3			
	J. Chem. Thermodyn. 1971, 3, 753-760.		
VARIABLES:	PREPARED BY.		
T/K: 282.91 - 298.46	H. L. Clever		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
x 104	Coefficient Coefficient		
282.91 1.43	2.82 2.92		
283.10 1.41	2.79 2.89		
297.63 2.13	4.13 4.50		
298.46 2.13	4.13 4.51		
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$	$X_1 = 18873 + 6.968 T$		
	1		
Std. Dev. $\Delta G^{\circ} = 28.5$ ,	Coef. Corr. = $0.9049$		
$\Delta H^{\circ}/J \text{ mol}^{-1} = 18873.$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -6.968$		
T/K Mol Fract	tion ΔG°/J mol <sup>-1</sup>		
	) <del>-</del>		
278.15 1.23	20,812		
283.15 1.43	20,847		
288.15 1.64	20,882		
	20,917		
303.15 2.42	20,986		
The solubility values were adjusted to a partial pressure of helium of			
101.325 kPa (1 atm) by Henry's law.			
The Bunsen coefficients were calculate	ed by the compiler.		
I			
AUXILIARY	INFORMATION		
METHOD: The apparatus is based on the	SOURCE AND DUDITY OF MATERIALS.		
design by Morrison and Billett (1)	1. Helium. Either Air Products &		
and the version used is described by	Chemicals, Inc., or Matheson Co.,		
Battino, Evans, and Danforth (2).	Inc. Better than 99 mol per cent.		
	(usually 99.9+).		
	2. Hexafluorobenzene. Imperial		
	Smelting Co., Avonmouth, U.K.		
APPARATUS/PROCEDURE: Degassing. Up to	GC purity 99.7%, density at 25°C		
flack of such size that the liquid is	1.60596 g cm <sup>-9</sup> , Purified by		
about 4 cm deep. The liquid is rapid-	see: <u>Anar</u> . <u>Chem</u> . 1900, <u>40</u> , 224.		
ly stirred, and vacuum is applied in-			
termittently through a liquid N <sub>2</sub> trap			
until the permanent gas residual	ESTIMATED ERROR: $tm/tr = 0.03$		
Solubility Determination. The de-	$\delta P/mmHq = 0.5$		
gassed solvent passes in a thin film	$\delta X_1 / X_1 = 0.03$		
down a glass spiral tube containing	1 -		
the solute gas plus the solvent vapor	REFERENCES:		
volume of gas absorbed is found by	L. Morrison, T. J. Billett. F		
difference between the initial and	J. Chem. Soc. 1948, 2033.		
final gas volume in the buret system.			
The solvent is collected in a tared	2. Battino, R.; Evans, F. D.; Danforth W. F.		
LIUSA and weighed.	J. Am. Oil Chem. Soc. 1968. 45.		
	830.		

CONDONING				
COMPONENTS:	ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7	Saylor, J. H.; Battino, R.			
2. Fluorobenzene; $C_{cH_5}F$ ; 462-06-6				
85.				
	<u>J. Phys. Chem</u> . 1958, <u>62</u> , 1334-1337.			
VARIABLES:	PREPARED BY:			
T/K: 288.15 - 328.15	H. L. Clever			
P/kPa: 101.325 (1 atm)				
EXPERIMENTAL VALUES:				
T/K Mol Fraction	Bunsen Ostwald			
X- x 10 <sup>4</sup>	$\alpha \times 10^2$ L $\times 10^2$			
288.15 1.01	2.44 2.57			
	3.14 3.60			
328.15 1.52	3.49 4.19			
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln 2$	$X_1 = 7936.8 + 48.830 \text{ T}$			
Std Dow $AC^{\circ} = 35 A$	Coef. Corr. = 0.9991			
$\Delta H^{\circ}/J \text{ mol}^{-1} = 7936.8,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -48.830$			
T/K MOI Fract	$\Delta G^{\circ}/J \mod \frac{1}{2}$			
288.15 1.02	22,007			
293.15 1.08	22,251			
	22,496			
308.15 1.27	22,984			
313.15 1.34	23,228			
318.15 1.40	23,472			
	23,716			
	23,960			
The solubility values were adjusted to	o a partial pressure of helium of			
101.325 kPa (1 atm) by Henry's law.				
The Bunsen coefficients were calculate	ed by the compiler.			
AUXILIARY	INFORMATION			
METHOD, The apparatus is based on the	COURCE AND BUDITY OF MATERIALS.			
design by Morrison and Billett (1)	SOURCE AND PURITY OF MALERIALS;			
and the version used is described by	standard and research grades were			
Clever, Battino, Saylor, and Gross (2)	• used.			
	2. Fluorobenzene. Eastman Kodak Co.			
	white label, dried over $P_4O_{10}$ ,			
	discilled, b.p. 84.28 - 84.08 C.			
APPARATUS/PROCEDURE: The solvent is de-	$\delta \pi / \kappa = 0.03$			
gassed by evacuating the space above	$\delta P/mmHq = 1$			
the liquid and shaking, followed by	$\delta x_1 / x_1 = 0.04$			
into an evacuated container. The	_			
degassed liquid passes as a thin	REFERENCES:			
liquid film down a glass spiral tube	1. Morrison, T. J.; Billett, F.			
containing the solute gas at a total	J. Chem. Soc. 1948, 2033.			
pressure of one atm (1,2).	2. Clever, H. L.: Battino R.			
	Saylor, J. H.; Gross, P. M.			
	J. Phys. Chem. 1957, 61, 1078.			

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COMPONENTS .					
	ORIGINAL MEASUREMENTS:				
1. Helium; He; 7440-59-7	de Wet, W. J.				
<pre>2. 1,1,2,2-Tetrachloroethane;C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub>: 79-34-5</pre>					
	<u>J. S. Afr. Chem. Inst</u> . 1964, <u>17</u> , 9-13.				
VARIABLES:	PREPARED BY:				
T/K: 291.25 - 304.05	P. L. Long				
EXPERIMENTAL VALUES:					
T/K Mol Fraction	Bunsen Ostwald				
$x_1 \times 10^4$	Coefficient Coefficient $\alpha \times 10^2$ L x 10 <sup>2</sup>				
291.25 0.997	2.12 2.26				
297.45 1.08	2.28 2.48				
	2.42 2.69				
Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT \ln$	$X_1 = 8,193.3 + 48.443 T$				
Std. Dev. $\Delta G^{\circ} = 13.2$ ,	Coef. Corr. = 0.9991				
$\Delta H^0/J \text{ mol}^{-1} = 8,193.3,$	$\Delta S^{0}/J K^{-1} mol^{-1} = -48.443$				
T/K Mol Fract	$4$ $\Delta G^{\circ}/J \text{ mol}^{-1}$				
$\frac{11}{288.15}$ $\frac{0.964}{0.964}$	22.152				
293.15 1.02	22,395				
	22,637 22,879				
308.15 1.20	23,121				
The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and Ostwald coefficients were calculated by the compiler.					
AUXILIARY	INFORMATION				
METHOD: Volumetric.	SOURCE AND PURITY OF MATERIALS.				
To degas, the solvent is placed in	1. Helium, No source given. The gas				
a large continuously evacuated bulb	purified over activated charcoal				
out further release of dissolved gases.	at liquid air temperature. Im- purities estimated to be less than 0.3 percent.				
To saturate, the solvent is flowed in	2 1 2 2-Tetrachloroethane No				
a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attach- ed buret system.	source given. 1,1,2,2-Tetrachloro- ethane distilled immediately before use.				
APPARATUS/PROCEDURE:	ESTIMATED ERROR:				
The apparentue is a medification of	δT/K = 0.05				
that used by Morrison and Billett(1)					
and others (2). The degassed solvent	BFEFDENCES.				
is saturated with gas as it flows through a glass spiral containing the	1. Morrison, T. J.; Billett. F.				
gas. The amount of solvent passing	J. <u>Chem.</u> Soc. 1948, 2033;				
through the spiral is such that 10 - 25 ml of gas was absorbed.	<u>ibid</u> . 1952, 3819.				
of gub was absorbed.	<ol> <li>Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.</li> </ol>				

COMPONENTS:	ORIGINAL MEASUREMENTS:		
1 Helium, He, 7440-59-7	Saylor, J. H.; Battino, R.		
1. neiium, ne, /440-55-7			
2. Chlorobenzene; C <sub>6</sub> H <sub>5</sub> Cl; 108-90-7			
	<u>J. Phys. Chem</u> . 1958, <u>62</u> , 1334 - 1337.		
VARIABLES:	PREPARED BY:		
1/K: 288.15 - 328.15	n. L. Clever		
P/kPa: 101.325 (1 atm)			
T/K Mol Fraction	Bunsen Ostwald		
	Coefficient Coefficient		
$X_1 \times 10^4$	$\alpha \times 10^2$ L x $10^2$		
288.15 0.597	1.32 1.39		
298.15 0.696	1.52 1.66		
313.15 0.853	1.84 2.11 2.11 2.53		
	2.11 2.55		
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$	$X_1 = 9951.1 + 46.251 T$		
Std. Dev $\Lambda G^{\circ} = 32.0$	Coef. Corr. = $0.9992$		
$\Delta H^{\circ}/J \text{ mol}^{-1} = 9951.1,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -46.251$		
T/K Mol Erac	tion AC <sup>o</sup> /I mol <sup>-1</sup>		
	3 23,278 7 23,510		
298.15 0.69	3 23,741		
303.15 0.74	0 23,972		
	9 24,203		
318.15 0.89	2 24,455		
323.15 0.94	5 24,897		
328.15 1.00	25,128		
The solubility values were adjusted to a partial pressure of belium of			
101.325 kPa (1 atm) by Henry's law.			
The Bunsen coefficients were calculate	ed by the compiler.		
AUXILIARY	INFORMATION		
design by Morrison and Billett (1)	SOURCE AND PURITY OF MATERIALS:		
and the version used is described by	Research grade was used.		
Clever, Battino, Saylor, and			
Gross (2).	2. Chlorobenzene. Eastman Kodak Co.		
	distilled h.p. $131.67 - 131.71$ °C.		
ADDADATHS (DDOGEDURE, The procedure is to	ESTIMATED ERROR:		
flow a thin layer of degassed liquid	$\delta T/K = 0.03$		
through a spiral containing the gas.	$\delta P/mmHg = 1$ $\delta X_2 / X_2 = 0.04$		
The gas dissolves rapidly and the saturated liquid flows into a burst			
system. The volume of gas dissolved	REFERENCES :		
is determined by the increase in the	1. Morrison, T. J.; Billett, F.		
solution level at constant pressure.	J. Chem. Soc. 1948, 2033.		
ves in is determined in the burets.	2 Clover W I + Patting D -		
For low solubilities extra solvent is	Saylor, J. H.; Gross. P. M.		
run through the buret system and	J. Phys. Chem. 1957, <u>61</u> , 1078.		
for high solubilities.			

COMPONENTS:	ORIGINAL MEASUREMENTS:		
	Saylor, J. H.; Battino, R.		
1. Hellum; He; /440-59-7			
2. Bromobenzene: C.H.Br: 108-86-1.			
	J Phys Chem 1958 62 1334 - 1337		
	$\underline{0}, \underline{1178}, \underline{01em}, \underline{1550}, \underline{02}, \underline{1554} = \underline{1557},$		
VARIABLES:	PREPARED BY:		
T/K: 288.15 - 328.15	H. L. Clever		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
	Coefficient Coefficient		
$X_1 \times 10^4$	$\alpha \times 10^2$ L x 10 <sup>2</sup>		
288 15 0 441	0 945 0 997		
298.15 0.550	1.16 1.27		
313.15 0.701	1.47 1.68		
328.15 0.782	1.61 1.94		
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$	$x_1 = 11183 + 44.244 T$		
Std Day $AC^{0} = 115 c$	Coef Corr = 0.9890		
	-0.5050		
$\Delta H^{\circ}/J \text{ mol}^{-1} = 11183.$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -44.244$		
T/K Mol Fract	tion ΔG°/J mol <sup>-1</sup>		
$X_1 \times 10$	)4		
288,15 0.459	23.932		
293.15 0.49	24,153		
298.15 0.53	24,374		
303.15 0.578	3 24,596		
308.15 0.621	L 24,817		
313.15 0.666	25,038		
	3 25,259		
323.15 0.70.	L 25,480		
	25,702		
The solubility values were adjusted to	o a partial pressure of helium of		
101.325 kPa (1 atm) by Henry's law.			
The Bunsen coefficients were calculate	ed by the compiler.		
AUXILIARY	INFORMATION		
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:		
design by Morrison and Billett (1)	1. Helium. Matheson Co., Inc.		
and the version used is described by	Research grade was used.		
Cross (2)	2. Bromobenzene, Eastman Kodak Co		
G1035 (2).	white label, dried over P4010.		
	distilled, b.p. 155.86 - 155.90°C		
LADDADATUS /DDOCEDUDE, The proceedure is to	ESTIMATED ERROR:		
flow a thin laver of decassed liquid	<b>*=</b> / <b>*</b> • • • •		
through a spiral containing the gas.	0T/K = 0.03		
The gas dissolves rapidly and the	OP/mmHg = 1		
saturated liquid flows into a buret	<u> </u>		
system. The volume of gas dissolved	REFERENCES :		
is determined by the increase in the	1. Morrison, T. J.: Billett, F		
The volume of liquid the gas dissol-	J. Chem. Soc. 1948, 2033.		
ves in is determined in the burete			
For low solubilities extra solvent is	2. Clever, H. L.; Battino, R.;		
run through the buret system and	Saylor, J. H.; Gross, P. M.		
weighed. An auxiliary buret is used	J. Phys. Chem. 1957, <u>61</u> , 1078.		
I for high solubilities.			

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COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7	Saylor, J. H.; Battino, R.		
2. Iodobenzene; C <sub>6</sub> H <sub>5</sub> I; 591-50-4			
	J. Phys. Chem. 1958, <u>62</u> , 1334 - 1337.		
VARIABLES:	PREPARED BY.		
T/K: 288.15 - 328.15	H. L. Clever		
P/kPa: 101.325 (1 atm)			
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
$x_1 \times 10^4$	Coefficient Coefficient α x 10 <sup>2</sup> L x 10 <sup>2</sup>		
288.15 0.298	0.601 0.634		
298.15 0.385	0.770 $0.8400.994$ $1.14$		
328.15 0.592	1.16 1.39		
Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$	$X_1 = 13325 + 40.068 \text{ T}$		
Std. Dev. ΔG° = 105.9	, Coef. Corr. = 0.9888		
$\Delta H^{\circ}/J \text{ mol}^{-1} = 13325,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -40.068$		
T/K Mol Frac X <sub>1</sub> x 1	tion $\Delta G^{\circ}/J \text{ mol}^{-1}$		
288.15 0.31	0 24,871		
	L 25,071		
303.15 0.40	B 25,472		
308.15 0.44 313.15 0.48	5 25,672 4 25.872		
318.15 0.52	4 26,073		
323.15 0.56 328.15 0.61	5 26,273 1 26,473		
The solubility values were adjusted to	o a partial pressure of belium of		
101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculat	ed by the compiler.		
AUXILIARY	INFORMATION		
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:		
design by Morrison and Billett (1) and the version used is described by	<ol> <li>Helium. Matheson Co., Inc. Research grade used.</li> </ol>		
Clever, Battino, Saylor, and	2 Jadahanaan Daatman Kadah Ga		
Gross (2).	2. IOdobenzene. Eastman Kodak Co., white label, shaken with dil.		
	aq. thiosulfate, washed with		
	led 77.40 - 77.60 °C under 20		
	mmHg.		
APPARATUS/PROCEDURE: The procedure is to	ESTIMATED ERROR: $\delta T/K = 0.03$		
through a spiral containing the gas.	$\delta P/mmHg = 1$		
The gas dissolves rapidly and the saturated liquid flows into a buret	$0^{1/1} = 0.04$		
system. The volume of gas dissolved	REFERENCES:		
is determined by the increase in the solution level at constant pressure.	1. Morrison, T. J.; Billett, F.		
The volume of liquid the gas dissol-	<u>U. Chem. 50C. 1946, 2033.</u>		
For low solubilities extra solvent is	2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.		
run through the buret system and weighed In auxiliary buret is used	J. Phys. Chem. 1957, <u>61</u> , 1078.		
for high solubilities.			

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COMPONENTS .			
	ORIGINAL MEASUREMENTS:		
1. Hellum; He; 7440-59-7	POWEII, K. J.		
2. Carbon Disulfide; CS <sub>2</sub> ; 75-15-0			
	J. <u>Chem</u> . <u>Eng</u> . <u>Data</u> 1972, <u>17</u> , 302-304.		
VARIABLES:	PREPARED BY:		
T/K: 298.15 P/kPa: 101.325 (1 atm)	P. L. Long		
EXPERIMENTAL VALUES:			
T/K Mol Fraction	Bunsen Ostwald		
Co	Defficient Coefficient		
$\frac{1}{200.15}$ $\frac{x_1 \times 10^{-1}}{200.15}$ $-$	$\frac{\alpha \times 10^2}{1000} = \frac{L \times 10^2}{1000}$		
298.15 0.39	1.44 1.57		
The Bunsen and Ostwald coefficients we	ere calculated by the compiler.		
AUXILIARY	INFORMATION		
METHOD:	<ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. No source given. Research grade, dried over CaCl<sub>2</sub> before use.</li> <li>2. Carbon Disulfide. No source given. Spectrochemical grade.</li> </ul>		
APPARATUS/PROCEDURE: Dymond and Hilde-	ESTIMATED ERROR:		
brand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calcu- lated from the initial and final gas pressures. The solvent is degassed by freezing and pumping followed by boiling under reduced pressure.	$\delta X_1/X_1 = 0.002$ REFERENCES: 1. Dymond, J. H.; Hildebrand, J. H. Ind. Eng. Chem. Fundam. 1967, <u>6</u> , 130.		

COMPONENTS:	ORIGINAL MEASUREMENTS:				
1. Helium; He; 7440-59-7	Dymond, J.H.				
<pre>2. Sulfinylbismethane (Dimethyl Sulf- oxide); C<sub>2</sub>H<sub>6</sub>OS (CH<sub>3</sub>SOCH<sub>3</sub>); 67-68-5</pre>	<u>J. Phys. Chem</u> . 1967, <u>71</u> , 1829 - 1831.				
VARIABLES:	PREPARED BY:				
T/K: 298.15 He P/kPa: 101.325 (1 atm)	M.E.Derrick				
EXPERIMENTAL VALUES:					
T/K Mol Fraction $X_1 \times 10^4$	Bunsen Ostwald Coefficient Coefficient $\alpha \times 10^2$ L x 10 <sup>2</sup>				
298.15 0.284	0.893 0.975				
The Bunsen and Ostwald coefficients we	ere calculated by the compiler.				
AUXILIARY	INFORMATION				
METHOD:	SOURCE AND PURITY OF MATERIALS:				
The liquid is saturated with the gas	<ol> <li>Helium. Stuart Oxygen Co. Dried before use.</li> </ol>				
The apparatus is that described by Dymond and Hildebrand (1). The appa- ratus uses an all-glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dis- solved is calculated from the initial and final gas pressure.	<ol> <li>Dimethylsulfoxide. Matheson, Cole- man, and Bell Co. Spectroquality reagent. Dried over 4A molecular seive and a fraction frozen out. Melting point 18.37 <sup>O</sup>C.</li> </ol>				
	ESTIMATED ERROR:				
	REFERENCES: 1. Dymond, J.; Hildebrand, J.H. <u>Ind. Eng. Chem</u> . <u>Fundam</u> . 1967, <u>6</u> ,130.				
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COMPONENTS:				ORIGINAL	MEASUREMENTS :	
l. Helium; He; 7440-59-7		Chang,	E. T.; Gokcen	, N. A.		
2. Methylh 60-34-4	ydrazine;	сн <sub>6</sub> N <sub>2</sub> (NHCH	H <sub>3</sub> NH <sub>2</sub> )			
				J. Phys	<u>s. Chem</u> . 1968,	<u>72</u> , 638 - 642.
VARIABLES:				PREPARED	BY:	
T/K ile P/k	: 253.24 Pa: 83.735	- 298.14 - 217.383			P. L. Long	
EVDEDIMENTAL V	(U.8264	- 2.1454 8	itm)			
T/K	P/Atm	Henry's Constant K x 10 <sup>4</sup>	Mol H X <sub>l</sub> x	Fraction	Bunsen Coefficient α x 10 <sup>2</sup>	Ostwald Coefficient L x 10 <sup>2</sup>
253.24	0.8264 <u>1.9837</u> 1.0000	1.39 1.57	0.1	L15 312 L47	0.65	0.60
	1.0000				0.05	
273.15	1.1448 2.1454 1.0000	1.78 1.95	0.2	204 118 186	0.81	0.81
298.14	1.1272 2.0617	2.46 2.63	0.2	278 541		
	1.0000		0.2	254	1.07	1.17
The Henry's one atm wer	constant e calculat	is defined ed from the	as K/a e avera	atm <sup>-1</sup> = ) ag <u>e Henry</u>	<pre>K1/P. The solu y's constant b</pre>	bility values at <u>y the compiler.</u>
Smoothed Da mole fracti fitted to:	ta: The 10 on solubil	l.325 kPa ities were	(l atm)	т/к	Mol Fraction $X_1 \times 10^4$	ΔG°/J mol <sup>-1</sup>
	DM ]n	v		253.15	0.145 0.156	23,449 23,760
NG / J MOI -	= 7699.0	^1 + 62.213 т		263.15	0.167	24,071
Std. Dev. A	$G^{\circ} = 38.4,$	Coef.		268.15	0.178	24,382
	Corr. = 0	.9996		278.15	0.202	25,004
∆H°/J mol <sup>-1</sup>	= 7699.0,	1		283.15	0.226	25,626
$\Delta S^{0}/J K^{-1} mol^{-1} = -62.213$		293.15	0.239	25,937		
	·			290.15	0.252	20,240
	_	AUX		INFORMATIC	DN	
METHOD: The so	lvent was	degassed un	nder	SOURCE AN	D PURITY OF MATE	RIALS:
aratus, App	aratus and	degassed s	solvent	= 1. не	elium. No info	rmation given.
were weighe	d. Gas was us at a km	introduced	l into 5. thei	2. M	ethvlhvdrazine	. Used in ini-
liquid stir	red, and t	he pressure	e ob-	t	ially distille	d, pure state.
served unti change. Equ	I there wa ilibrium w	s no furthe as establis	er shed	No	o source or %	purity given.
within 10 m	and the P	was follow	ved for	;		
40 m. Subst decompose w	ituted hyd ith time.	razınes app For decompo	pear to osing			
solvents th	e P was fo	llowed for	up to			
rected for	the gaseou	s decomp. p	prod.	- 		
APPARATUS / PROC	EDURE: The a	pparatus wa	as of	ESTIMATED	ERROR:	03
all Pyrex g	lass const	ruction. It	con-		δP/mmHg	= 0.01
the measure	ment of th	e gas, a co	n = 10	-	$\delta x_1 / x_1 =$	0.05
tainer for	the solven h a glass	t, which wa	as agnet.	REFERENCE	S:	
and a manom	eter with	a microslid	le	l. Char	ng, E. T.; Gok	cen, N. A.
catnetomete sure. The	r for meas solvent co	uring the p ntainer had	l a	<u>J</u> . 1	Phys. Chem. 19	ob, <u>70</u> , 2394.
capacity fo	r 100 g of	solvent wi	ith a			
face. The	ace above apparatus	sections_we	ere			
calibrated	to ± 0.000	$2 - 3 \text{ cm}^3$	(1).			

		·····	+			
COMPONENTS:			ORIGINA	AL MEASU	IREMENTS:	N7 7
l. Helium;	He; 7440-	59 <b>-</b> 7		J, E. 1	Gokcen,	, N. A.
2. 1,1-Dim (NH <sub>2</sub> N(C	ethylhydra H <sub>3</sub> ) <sub>2</sub> ); 57-	zine; C2 <sup>H</sup> 8 <sup>N</sup> 2 14-7	<u>J.</u> <u>P</u>	nys. Ch	<u>1968</u> , 1968,	<u>72</u> , 638 - 642.
VARIABLES: T/K: He P/kPa	253.05 - : 118.743 (1.1719	293.16 - 228.093 - 2.2511 Atm)	PREPARI	ED BY: I	P. L. Long	
EXPERIMENTAL V	ALUES:				<b>D</b>	0-1
т/к	P/Atm	$\frac{\text{Henry's}}{\text{Constant}} \xrightarrow{\text{MOI}} \frac{X_1 \times 10^5}{X_1 \times 10^5}$	10 <sup>4</sup>	on Co 	bunsen pefficient $\alpha \times 10^2$	$\frac{\text{Coefficient}}{\text{L x } 10^2}$
253.05	1.1719	4.97 0. 4.93 1	583 003			
	1.0000	<u>4.55</u> 1. 0.	495		1.53	1.42
273.15	1.3684 2.2511	6.72 0. 6.89 1.	919 551			
	1.0000	0.	680		2.05	2.05
293.16	1.4394 2.2158	8.70 1. 8.94 1.	253 981		2 56	2 77
The Henry's	constant	is defined as K/	<u></u>	= X1/P	The solut	nility values at
one atm wer	e calculat	ed from the aver	age <u>Her</u>	nry's d	constant by	y the compiler.
Smoothed Da	ta: The l	01.325 kPa (1 at	m) T/	K N	Iol Fractic	on ∆G°/J mol <sup>-⊥</sup>
to:	on solubil	ities were fitte	a 248	3.15	0.457	20,616
∆G°/J mol-1	= -RT ln	X <sub>1</sub>	253	3.15	0.498	20,855
	= 8787.8	+ <sup>-</sup> 47.667 T	250	3.15	0.539	21,093
Std. Dev. $\Delta$	$G^{\circ} = 13.0,$	Coef.	268	3.15	0.628	21,570
		.9999	273	3.15 3.15	0.676	22,046
ΔH°/J mol-1	= 8/8/.8 $\Delta S^{\circ}/J K^{-1}$	$mol^{-1} = -47.667$	283	3.15	0.774	22,285
			200	3.15	0.820	22,525
-			298	3.15	0.934	23,000
		AUXILIARY	INFORMA	TION		
METHOD: The s	olvent was	degassed under	SOURCE	AND PUP	RITY OF MATER	RIALS:
aratus. App were weighe	aratus and d. Gas was	degassed solven introduced into	t 1. F	Helium.	. No inform	mation given.
the apparat liquid stir served unti change. Equ	us at a kn red, and t l there wa ilibrium w	own P and T, the he pressure ob- s no further as established	2. ] j	l,l-Din initial No sour	nethylhydra Lly distill cce or % pu	azine. Used in Led, pure state. urity given.
within 10 m 40 m. Subst decompose w solvents th	and the P ituted hyd ith time. e P was fo	was followed fo razines appear t For decomposing llowed for up to	r 0			
rected for	e solupili the gaseou	cy value was cor s decomp. prod.	I			
APPARATUS/PROC	EDURE: The	apparatus was of	ESTIMA	TED ERRO	)R:	13
all Pyrex g	lass const	ruction. It con-	1		$\delta P/mmHg =$	0.01
the measure	ment of th	e gas, a con-	ſ		$\delta X_1 / X_1 = 0$	0.05
tainer for	the solven	t, which was	REFERE	NCES:		
and a manom	eter with	a microslide		hang F	τ. Τ. · Coke	ren N.A.
cathetomete	r for meas olvent con	uring the pres-	<u><u> </u></u>	Phys.	<u>Chem</u> . 196	66, <u>70</u> , 2394.
capacity fo	r 100 g of	solvent with a				
5 ml gas sp face. The a calibrated	ace above pparatus s to ± 0.000	the liquid sur- ections were 2 - 3 cm <sup>3</sup> (1).				

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COMPONENTS: 1. Helium; He; 7440-59-7	ORIGINAL MEASUREMENTS: Chang, E.T.; Gokcen, N.A.	
<pre>2. 1,2-Dimethylhydrazine; C<sub>2</sub>H<sub>8</sub>N<sub>2</sub> (NHCH<sub>3</sub>NHCH<sub>3</sub>); 540-73-8</pre>	J. <u>Phys</u> . <u>Chem</u> . 1968, <u>72</u> , 638 - 642.	
VARIABLES: T/K: 273.15 - 298.15	PREPARED BY:	
P/kPa: 101.325 (1 atm)	P. L. Long	
EXPERIMENTAL VALUES:		

The authors made no experimental measurements on this system. The authors do given an estimated Gibbs energy equation for the solution of helium in 1,2dimethylhydrazine. They used logical assumptions to find a linear relationship between the Gibbs energy of solution of helium in hydrazine, methylhydrazine, and 1,1-dimethylhydrazine as a function of  $1/r^{12}$ , where r is the distance of approach of solvent and solute molecules. The value of r in each solvent was determined from a simple cell model. The linear relationship was extrapolated to obtain the estimated value of the Gibbs energy of solution of helium in 1,2-dimethylhydrazine. The estimated equation is

 $\Delta G^{O}/cal mol^{-1} = -RT ln K/atm^{-1} = 2,490 + 7.70T$ 

where K is the Henry's constant defined as  $K/atm^{-1} = X_1/P$ . The pressure is in atm.The mole fraction solubilities at 101.325 kPa (1 atm) tabulated below were calculated from the equation by the compiler.

Т/К	$\frac{\text{Mol Fraction}}{X_1 \times 10^4}$
273.15 278.15 283.15 288.15 293.15 298.15	0.0211 0.0229 0.0248 0.0268 0.0289 0.0310

AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
Estimated data, see above.	
APPARATUS / PROCEDURE •	ESTIMATED ERROR:
	REFERENCES :

$\begin{array}{c} \text{ORIGINALIS:} \\ \text{I. Helium; He; 7440-59-7} \\ \text{2. Hydrazine; N_2H_4; 302-01-2} \\ \text{3. 1,1-Dimethylhydrazine; C_2H_8N_2} \\ \text{(NH_2N(CH_3)_2); 57-14-7} \\ \hline \\ \hline \\ \text{VARIABLES:} \\ \text{T/K: 273.15 - 303.15} \\ \text{P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm)} \\ \hline \\ \text{EXPERIMENTAL VALUES:} \\ \hline \\ \hline \\ \text{1,1-Dimethyl-} \\ \text{hydrazine, X_3} 273.15 - 303.15 \text{ K K = X_1} \\ \text{Unit:cal mol^{-1}} \\ \hline \\ \text{Unit: Cal mol^{-1}} \\ \hline \\ \text{0.1 1,230 + 19.02T} \\ \hline \\ \text{0.2 1,230 + 19.02T} \\ \hline \\ \end{array}$	NAL MEASUREMENTS:         ang, E.T.; Gokcen, N.A.         Phys. Chem. 1968, 72, 2556 - 2562.         RED BY:         P.L.Long, H.L.Clever         's Constant, Mol Fraction $1/P$ $X_1 \times 10^4$ atm <sup>-1</sup> At 1 atm $0^6$ at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.1880         23.6       0.236
1. Helium; He; 7440-59-7 2. Hydrazine; $N_2H_4$ ; 302-01-2 3. 1,1-Dimethylhydrazine; $C_2H_8N_2$ (NH <sub>2</sub> N(CH <sub>3</sub> ) <sub>2</sub> ); 57-14-7 VARIABLES: T/K: 273.15 - 303.15 P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm) EXPERIMENTAL VALUES: 1,1-Dimethyl- $\triangle G^{O} = -RT \ln K$ Henry' hydrazine, X <sub>3</sub> 273.15 - 303.15 K K = X <sub>1</sub> Unit:cal mol <sup>-1</sup> 0.0 1,260 + 19.94T 0.1 1,230 + 19.02T 0.2 1,210 + 17.207	Phys. Chem. 1968, 72, 2556 - 2562.         RED BY:         P.L.Long, H.L.Clever         's Constant, Mol Fraction         1/P       X1 × 10 <sup>4</sup> atm <sup>-1</sup> At 1 atm         06 at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.236
2. Hydrazine; $N_2H_4$ ; $302-01-2$ 3. 1,1-Dimethylhydrazine; $C_2H_8N_2$ (NH <sub>2</sub> N(CH <sub>3</sub> ) <sub>2</sub> ); 57-14-7 VARIABLES: T/K: 273.15 - 303.15 P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm) EXPERIMENTAL VALUES: 1,1-Dimethyl- $\triangle G^{O} = -RT \ln K$ Henry' hydrazine, X <sub>3</sub> 273.15 - 303.15 K K = X <sub>1</sub> Unit:cal mol <sup>-1</sup> Unit: $M_1 = \frac{1}{2}$	Phys. Chem. 1968, 72, 2556 - 2562.         RED BY:         P.L.Long, H.L.Clever         's Constant, Mol Fraction $1/P$ $X_1 \times 10^4$ $atm^{-1}$ At 1 atm $0^6$ at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.236
3. 1,1-Dimethylhydrazine; $C_2H_8N_2$ (NH <sub>2</sub> N(CH <sub>3</sub> ) <sub>2</sub> ); 57-14-7       J. I         VARIABLES: T/K: 273.15 - 303.15       PREPA         P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm)       PREPA         EXPERIMENTAL VALUES:       1,1-Dimethyl- $\Delta G^{O} = -RT \ln K$ Henry' hydrazine, X <sub>3</sub> 273.15 - 303.15 K K = X <sub>1</sub> Unit:cal mol <sup>-1</sup> Henry' K × 10         0.0       1,260 + 19.94T       Unit: K × 10         0.1       1,230 + 19.02T       0.1	Phys. Chem. 1968, 72, 2556 - 2562.         RED BY:         P.L.Long, H.L.Clever         's Constant, Mol Fraction $1/P$ $X_1 \times 10^4$ $atm^{-1}$ At 1 atm $0^6$ at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.236
VARIABLES: T/K: 273.15 - 303.15 P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm) EXPERIMENTAL VALUES: 1,1-Dimethyl- $\triangle G^{O} = -RT \ln K$ Henry' hydrazine, X <sub>3</sub> 273.15 - 303.15 K K = X <sub>1</sub> Unit:cal mol <sup>-1</sup> Unit: 	RED BY:       P.L.Long, H.L.Clever         's Constant,       Mol Fraction         1/P       X1 × 10 <sup>4</sup> atm <sup>-1</sup> At 1 atm         06 at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.236
P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm) EXPERIMENTAL VALUES: 1,1-Dimethyl- AG <sup>O</sup> = -RT ln K Henry' hydrazine, X <sub>3</sub> 273.15 - 303.15 K K = X <sub>1</sub> Unit:cal mol <sup>-1</sup> Unit: 0.0 1,260 + 19.94T 0.1 1,230 + 19.02T 0.2 1,210 + 17.20T	P.L.Long, H.L.Clever P.L.Long, H.L.Clever P.L.Long, H.L.Clever P.L.Long, H.L.Clever P.L.Long, H.L.Clever P.L.Long, H.L.Clever Note: Comparison of the second
$ \begin{array}{c} 253.313  (2.5 \text{ atm}) \\ \hline \\ \text{EXPERIMENTAL VALUES:} \\ \hline 1,1-\text{Dimethyl-} & \Delta G^{O} = -\text{RT ln K} & \text{Henry'} \\ \text{hydrazine, X_3} & 273.15 - 303.15 \text{ K K} = X_1 \\ \text{Unit:cal mol^{-1}} & \text{Unit:} \\ \hline \\ \hline 0.0 & 1,260 + 19.94T \\ 0.1 & 1,230 + 19.02T \\ 0.2 & 1.310 + 13.20m \end{array} $	's Constant,       Mol Fraction $1/P$ $X_1 \times 10^4$ $atm^{-1}$ At 1 atm $0^6$ at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.236
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	's Constant,       Mol Fraction $1/P$ $X_1 \times 10^4$ $atm^{-1}$ At 1 atm $0^6$ at 288.15 K       and 288.15 K         4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.236
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$1/P$ X1       x 10 <sup>4</sup> $atm=1$ At       1 atm $0^6$ at       288.15 K $4.86$ 0.0486 $8.14$ 0.0814 $13.07$ 0.1307 $18.80$ 0.1880 $23.6$ 0.236
0.0 1,260 + 19.94T 0.1 1,230 + 19.02T 0.2 1,210 + 17.20T	4.86       0.0486         8.14       0.0814         13.07       0.1307         18.80       0.1880         23.6       0.236
0.2       1,310 + 17.80T       1         0.3       1,900 + 15.03T       1         0.4       2,150 + 13.71T       2         0.5       2,210 + 13.09T       2         0.6       2,220 + 12.63T       3         0.7       2,200 + 12.29T       4         0.8       2,170 + 11.99T       5         0.9       2,140 + 11.67T       6         1.0       2,110 + 11.36T       8	29.0       0.290         36.0       0.360         44.2       0.442         54.2       0.542         67.0       0.670         82.6       0.826
temperature range. The Henry's constant is based on data measu pressure range. The value in the Table abov 288.15 K. Values at other temperatures can energy equation. The mole fraction solubility at 288.15 K an ulated by the compiler. The solubility of helium was measured in hy and in four mixtures at three temperatures	ured over the 0.5 - 2.5 atm ve is the Henry's constant at be calculated from the Gibbs nd 101.325 kPa (1 atm) was calc- ydrazine, 1,1-dimethylhydrazine, and several pressures. The data
were smoothed to obtain the Gibbs energy equation the second seco	quations at 0.1 mol fraction in-
	MATION
METHOD: The solvent was degassed under vacuum in the previously weighed app- aratus. Apparatus and degassed solvent were weighed. Gas was introduced into the apparatus at a known P and T, the liquid stirred, and the pressure ob- served until there was no further change. Equilibrium was established within 10 m and the P was followed for 40 m. Substituted hydrazines appear to decompose with time. For decomposing solvents the P was followed for up to 2 h, and the solubility value was cor- rected for the gaseous decomp.product. APPARATUS/PROCEDURE: The apparatus was of all Pyrex glass construction. It con- sisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer with a microslide catheto- meter for measuring the pressure. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The apparatus sections were calibrated to ± 0.0002 -	SE AND PURITY OF MATERIALS: source and purity of the materials e not given. The density and ractive index of the solvent ponents and several of their tures are given. The solvents e freshly distilled before use. MATED ERROR: $\delta T/K = 0.03$ $\delta P/mmHg = 0.01$ $\delta X_1/X_1 = 0.05$ RENCES: Chang, E.T.; Gokcen, N.A. J. Phys. Chem. 1966, 70, 2394.

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COMPONENTS .		ODICINAL MEACUD	EMENTC .	
CUMPUNENTS:		Friedman, H.	L.	
l. Helium; He; 7440-59-7				
2. Nitromethane; CH <sub>3</sub> NO <sub>2</sub> ;	75-52-5			
		J. Am. Chem.	Soc. 1954, 76,	3294-3297.
VARIABLES:		PREPARED BY:		
T/K: 298.00		P	. L. Long	
P/kPa: 93.326 (700	) mmHg)			
EXPERIMENTAL VALUES:				
T/K	Mol Fraction	Bunsen	Ostwald	
	$x_1 \times 10^4$	coefficient α x 10 <sup>2</sup>	$L \times 10^2$	
298.00			1 69	
250.00			1.76	
	0.386	1.60	<u> </u>	
Bunsen coefficient and the were calculated by the co and that Henry's law is c	ne mole fracti ompiler with t obeyed.	on solubility the assumption	at 101.325 kP is that the gas	a (l atm) is ideal,
	AUXILIARY	INFORMATION		
METHOD:		SOURCE AND PURI	TY OF MATERIALS:	
Gas absorption.The essentially that employed and Herzberg (1). Modific included a magnetic stirr instead of shaking the sa vessel, and balancing the against a column of more	e method was by Eucken ations ing device turation gas pressure rv with	<ol> <li>Helium. A grade, 99 spectrosc</li> <li>Nitrometh Distilled 253 K</li> </ol>	ir Reduction C 8.8 per cent pu copy. ane. Source no 1, dried by fil	o. Reagent re by mass t given. tering at
electrical contacts inste ing the gas pressure agai mosphere.	ad of balanc- nst the at-	200		
APPARATUS/PROCEDURE: The solv	ent was de-	ESTIMATED ERROF	$\delta \pi / \kappa = 0.05$	
gassed by vacuum. The pro peated 5 - 10 times, was 5 - 15 s evacuation and r	cedure, re- to alternate apid stirring	δ₽/	mmHg = 0.03 $\delta L/L = 0.03$	
to produce cavitation. In	the solubil-	REFERENCES:	<u> </u>	
solvent vapor, was brough tact with about 80 ml of the saturation vessel. In itions were established b	t into con- solvent in itial cond- y a time ex- cuilibrium	1. Euken, A. <u>2</u> . <u>Phys</u> .	; Herzberg, G. <u>Chem</u> . <u>1950</u> , <u>19</u>	<u>5</u> , 1.
was approached from both supersaturation by varyin	under- and g the rate.			

COMPONENTS :	ORIGINAL MEASUREMENTS:	
l. Helium; He; 7440-59-7	Wood, R.H.; DeLaney, D.E.	
2. N-Methylacetamide; C <sub>3</sub> H <sub>7</sub> NO (CH <sub>3</sub> CONHCH <sub>3</sub> ); 79-16-3	<u>J.Phys.Chem</u> . 1968, <u>72</u> , 4651 - 4654.	
VARIABLES: T/K: 308.15 - 343.15	PREPARED BY:	
He P/kPa: 101.325 (1 atm)	P.L.Long	
The authors fitted their experimental data by the method of least squares to the equation $\ln x_1 = -1152.5/T - 6.0579$		
which arranges to $\Delta G^{O}/J \text{ mol}^{-1} = -RT$ ]	$\ln X_1 = -RT(-1152.5/T - 6.0579) \\ = 9,582.3 + 50.367T$	
and $\Delta H^{O}/J \text{ mol}^{-1} = 9,582$	2.3, $\Delta S^{O}/J K^{-1} mol^{-1} = -50.367$	
The experimental data was not included in the paper. It is available in a thesis (1). The smoothed mole fraction helium solubilities at 101.325 kPa and five degree interval from 308.15 to 343.15 K were given in the paper. The Bunsen and Ostwald coefficients and the Gibbs energy of solution were calculated by the compiler.		
Smoothed Data: $T/K$ Mol Fraction I Coe $X_1 \times 10^4$ c	Bunsen Ostwald <b>∆</b> G <sup>O</sup> /J mol <sup>-1</sup> efficient Coefficient ★ x 10 <sup>2</sup> L x 10 <sup>2</sup>	
308.15       0.557         313.15       0.591         318.15       0.626         323.15       0.663         328.15       0.699         333.15       0.738         338.15       0.776         343.15       0.816	1.621.8225,1031.711.9625,3551.802.1025,6071.902.2525,8581.992.3926,1102.092.5526,3622.192.7126,6142.302.8826,866	
AUXILIARY	INFORMATION	
METHOD:	<ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. Source not given. Purity 99.99 per cent.</li> <li>2. N-Methylacetamide.Source not given. Recrystallized three times in a dry box. Typically had a water content of 0.04 mol per cent after a solubility run.</li> </ul>	
	ESTIMATED ERROR:	
a three-way capillary stopcock. A measured volume of gas was transferred	Duplicate runs checked to within 0.5 percent.	
to a known volume of solvent; when equilibrium was reached the total	REFERENCES:	
pressure and volume of the system was measured (1). The apparatus and procedure were checked by measuring the solubility of Ar in H <sub>2</sub> O at 298.15	<pre>l. DeLaney, D.E. M.S. Thesis, University of Delaware, 1968.</pre>	
K. The Bunsen coefficient of 0.03105 checked well with the literature (2).	2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735;	

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2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, <u>59</u>, 2735; <u>ibid.</u> 1964, <u>60</u>, 1736.

COMPONENTS		ODICINAL MEACUDEMENTS .	
1. Helium; He; 7440-59-7		Saylor, J. H.; Battino, R.	
2. Nitrobenzene; C <sub>6</sub> H5NO <sub>2</sub> ; 98-95-3			
	0 5 2.	<u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334 - 1337.	
VARIABLES:		PREPARED BY:	
т/к: 288	3.15 - 328.15	H. L. Clever	
P/kPa: 101.	.325 (l atm)		
EXPERIMENTAL VALUES:	VV Mol Eraction	Runson Ostupld	
-	YR HOI FIACCION	Coefficient Coefficient	
	$X_{1} \times 10^{4}$	$\alpha \times 10^2$ L $\times 10^2$	
288	3.15 0.265	0.581 0.613	
298	3.15 0.377	0.822 0.897	
313	3.15 0.494		
	-	1.15 1.56	
Smoothed Data: AC	$3^{\circ}/J \text{ mol}^{-1} = - RT \ln$	$X_1 = 13508 + 39.990 T$	
St	td. Dev. ∆G° = 229.4	, Coef. Corr. = 0.9503	
	$H^{0}/J mol^{-1} = 13508$	$AS^{2}/I K^{-1} mol^{-1} = -39 990$	
	$\frac{T/K}{2} \qquad \frac{Mol \ Frac}{X_1 \ x \ 1}$	0 <sup>4</sup>	
	288.15 0.29	0 25,031	
	293.15 0.31	9 25,231	
	303.15 0.38	3 25.631	
	308.15 0.41	8 25,831	
	313.15 0.45	5 26,031	
	318.15 0.49	4 26,231	
	328.15 0.57	7 26,631	
The solubility val	lues were adjusted t	o a partial pressure of helium of	
The Bunsen coeffic	cients were calculat	ed by the compiler.	
	AUXILIARY	INFORMATION	
METHOD: The encoded on the COURCE AND DUDITY OF MATERIALS.			
design by Morrison	n and Billett (1)	1. Helium. Matheson Co., Inc.	
and the version us	sed is described by	Research grade was used.	
Clever, Battino, S	Saylor, and	2 Nitrobonzono Fastman Kodak Co	
Gross (2).		white label, distilled from	
		P <sub>4</sub> O <sub>10</sub> , reduced pressure of 10 mm	
		of fig, b.p. 81.0 - 81.2 °C.	
		1	
APPARATUS/PROCEDURE: The procedure is to		ESTIMATED ERROR:	
flow a thin layer of degassed liquid		$\delta T/K = 0.03$	
through a spiral containing the gas.		$\delta P/mmHg = 1$	
The gas dissolves rapidly and the		$\delta x_1 / x_1 = 0.04$	
system. The volum	ne of gas dissolved	REFERENCES :	
is determined by t	he increase in the	1. Morrison, T. J.; Billett, F.	
solution level at	constant pressure.	<u>J. Chem. Soc</u> . 1948, 2033.	
ves in is determin	ned in the burets.	2. Clever, H. L.: Battino, R.	
For low solubiliti	les extra solvent is	Saylor, J. H.; Gross, P. M.	
run through the bu	iret system and	J. Phys. Chem. 1957, 61, 1078.	
for high solubilit	Liary Duret 15 Used		

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COMPONENTS:	ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7	Powell, R.J.			
<pre>2. 1,1,2,2,3,3,4,4,4-Nonafluoro-N,N- bis (nonafluorobutyl)-1-butanamin (Perfluorotributylamine) ;C<sub>12</sub>F<sub>27</sub>N 311-89-7</pre>	<u>J.Chem</u> . <u>Eng</u> . <u>Data</u> 1972, <u>17</u> , 302-304.			
VARIABLES:	PREPARED BY:			
T/K: 288.15 - 313.15	P.L.Long			
He P/kPa: 101.325 (1 atm)	_			
EXPERIMENTAL VALUES:				
T/K Mol Fraction Bunse	en Ostwald Alog Xi			
$\frac{x_1 \times 10^4}{6 \times 10^4}$	$\frac{1109 \text{ K}}{102} \text{ L x 10^2} \text{ R} \frac{1109 \text{ K}}{4109 \text{ T}} = \text{N}$			
298.15 11.67 7.3	4 8.01 4.13			
The author states that solubility mer 313.15 K, but only the solubility at slope R( $\Delta \log X_1/\Delta \log T$ ) was given. The the compiler from the slope in the f	asurements were made between 288.15 and 298.15 K was given in the paper. The he smoothed data below were calculated by brm:			
$\log x_1 = \log(11.67 \times 100)$	$10^{-}$ + (4.13/R) $10g(1/298.15)$			
With $R = 1.98/2$ cal $R = mot$	1 Proction			
	$X_1 \times 10^4$			
288.15 293.15 298.15 303.15 308.15 313.15	10.87 11.27 11.67 12.08 12.50 12.92			
The Bunsen and Ostwald coefficients were calculated by the compiler.				
AUXILIAR	Y INFORMATION			
METHOD:	SOURCE AND PURITY OF MATERIALS:			
	<ol> <li>Helium. No source given. Research grade, dried over CaCl<sub>2</sub> before use.</li> <li>Perfluorotributylamine. Minnesota Mining &amp; Manufacturing Co. Distill- ed. used portion boiling between</li> </ol>			
	447.85-448.64 K which gave a single GLC peak. $d_{298.15} = 1.880$ g cm <sup>-3</sup> .			
APPARATUS/PROCEDURE: Dymond and Hildebra (1) apparatus which uses an all glas pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculate	ESTIMATED ERROR: $\delta N/cal K^{-1} mol^{-1} = 0.1$ $\delta X_1/X_1 = 0.002$			
from the initial and final gas pressures. The solvent is degassed b freezing and pumping followed by boiling under reduced pressure.	REFERENCES: y l. Dymond, J.H.; Hildebrand, J.H. <u>Ind. Eng. Chem. Fundam</u> . 1967, <u>6</u> ,130			

COMPONENTS:	ORIGINAL MEASUREMENTS:			
1. Helium-3; <sup>3</sup> He; 14762-55-1	Powell, R. J.			
<pre>2. 1,1,2,2,3,3,4,4,4-nonafluoro-N,N- bis(nonafluorobuty1)-1-butanamine (Perfluorotributy1amine); C12F27N 311-89-7 VARIABLES: T/K: 273.15 - 318.15 He P/kPa: 101.325 (1 atm)</pre>	<u>J. Chem. Eng. Data</u> 1972, <u>17</u> , 302-304. PREPARED BY: P. L. Long			
EXPERIMENTAL VALUES:				
$\frac{17 \times 10^4}{2}$	$\begin{array}{ccc} \text{Insen} & \text{Ostward} & \text{R} \frac{\lambda \log  X }{\Delta \log  T } = N \\ \text{ficient} & \text{L} \times 10^2 & \underline{\text{L} \times 10^2} & \underline{\text{L} \times 10^2} \end{array}$			
298.15 11.02 6	5.93 7.56 4.24			
The author states that solubility measurements were made between 288.15 and 313.15 K, but only the solubility at 298.15 was given in the paper. The slope $R(\Delta \log X_1/\Delta \log T)$ was given. The smoothed data below were calculated by the compiler from the slope in the form:				
$\log x_1 = \log(11.02)$	$x 10^{-4}$ ) + (4.24/R) log(T/298.15)			
with $R = 1.9872$ cal $K^{-1} mol^{-1}$ .				
Smoothed Data: T/K Mo	$\lambda_1 \times 10^4$			
288.15 293.15 298.15 303.15 308.15 313.15 318.15 The Bunsen and Ostwald coefficients we	10.25 10.63 11.02 11.42 11.82 12.24 12.66 ere calculated by the compiler.			
AUXILIARY	INFORMATION			
METHOD:	<ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium-3. Lawrence Radiation Laboratory, Berkeley, through the efforts of B. J. Alder.</li> <li>2. Perfluorotributylamine. Minnesota Mining &amp; Mfg. Co., column distilled, used portion with b.p.=447.85-448.64K, &amp; single peak GC.</li> </ul>			
APPARATUS/PROCEDURE: Dymond and Hilde- brand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is cal- culated from the initial and final gas pressures. The solvent is de- gassed by freezing and pumping fol- lowed by boiling under reduced pressure.	ESTIMATED ERROR: $\delta N/cal K^{-1} mol^{-1} = 0.1$ $\delta X_1/X_1 = 0.002$ REFERENCES: 1. Dymond, J. H.; Hildebrand, J. H. Ind. Eng. Chem. Fundam. 1967, 6, 130.			

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COMPONENTS: 1. Helium; He; 7440-59-7	ORIGINAL MEASUREMENTS: Wilcock, R.J.; McHale, J.L.;		
2. Octamethylcyclotetrasiloxane:	Battino, B.; Wilhelm, E.		
C <sub>8</sub> H <sub>24</sub> O <sub>4</sub> Si <sub>4</sub> ; 556-67-2	<u>Fluid Phase</u> Equilib.1978, <u>2</u> , 225-230.		
VARIABLES: T/K: 292.15 - 313.15	PREPARED BY:		
P/kPa: 101.325 (1 atm)	H.L. Clever		
T/K Mol Fraction	Bunsen Ostwald		
x <sub>1</sub> x 10 <sup>4</sup>	Coefficient Coefficient		
	$\frac{\alpha \times 10^{-1}}{-10^{-1}} = \frac{1}{10^{-1}}$		
292.15 5.20 298.48 5.57	3.763 4.025 4.005 4.376		
313.15 6.25	4.408 5.054		
The solubility values were adjusted t	o a gas partial pressure of 101.325		
Kra by Henry's law.	ed by the compiler		
Smoothed Data: $\Lambda G^{O}/J \mod^{-1} = -RT \ln$	$X_{-} = 6.558.5 + 40.381 \text{ T}$		
Std. Dev. $\Delta G^{O} = 14.8$ ,	Coef. Corr. = 0.9994		
$\Delta H^{O}/J mol^{-1} = 6,5585,$	$\Delta S^{O}/J K^{-1} mol^{-1} = -40.381$		
T/K Mol Fr	action $\Delta G^{O}/J \text{ mol}^{-1}$		
x <sub>1</sub> x	104		
293.15 5.	27 18,396		
298.15 5. 303.15 5.	52 18,598 76 18,800		
308.15 6.	01 19,002		
313.15 0.	20 19,204		
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
The apparatus is based on the de- sign of Morrison and Billett (1), and	1. Helium. Matheson Co., Inc. Minimum mole per cent purity		
the version used is described by	99.995.		
The degassing apparatus and procedure	2. Octamethylcyclotetrasiloxane.		
are described by Battino, Banzhof, Bogan, and Wilhelm (3).	General Electric Co. Distilled density of 298.15 K was 0.9500		
Degassing. Up to 500 cm <sup>3</sup> of sol-	g cm <sup>-3</sup> .		
size that the liquid is about 4 cm.			
and vacuum is applied intermittently			
through a liquid N <sub>2</sub> trap until the permanent gas residual pressure	ESTIMATED ERROR:		
drops to 5 microns.	$\delta P/mHg = 0.5$		
gassed solvent is passed in a thin	$\delta x_1 / x_1 = 0.02$		
tiim down a glass spiral tube con- taining the solute gas plus the sol-	REFERENCES:		
vent vapor at a total pressure of one atm. The volume of gas absorbed	1.Morrison,T.J.;Billett,F. J. Chem. Soc. 1948. 2033.		
is found by difference between the	2.Battino,R.;Evans,F.D.;Danforth,W.F.		
buret system. The solvent is col-	3. Battino, R.; Banzhof, M.; Bogan, M.;		
lected in a tared flask and weighed.	Wilhelm, E. Anal. <u>Chem</u> . 1971, 43, 806.		

COMPONENTS :		ORIGINAL MEASUREMENTS:		
1. Helium; He; 7440-59-7		Karasz, F.E.; Halsey, G.D.Jr.		
2. Argon; Ar; 7440-37-1				
2. Algon, Al, 7440-57-1		T Cham Bhug 1059 20 172 - 170		
		<u><u><u></u></u>. <u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u>		
VARIABLES: T/K: 84.5	4 - 86.89	PREPARED BY: P. L. Long		
He P/kPa: 2.66	6 - 21.332			
EVDEDIMENTAL VALUES.	16 CmHg)			
EXIENTRE VALUES:	T/K Henry's Consta	ant Mol Fract	ion	
	10-5K/cmHa	At He P = 1 cmHg A $x_1 = x_1 + x_2$	t He P = 76 cmHg $X_{2} \times 10^{4}$	
_				
	84.54 4.25	0.0235	1.79	
	86.89 3.40	0.0283 0.0294	2.15	
The authors did not present numerical values of their solubility data. The data were shown in two graphs: one was a Henry's law plot of He P/cmHg against mole fraction He dissolved in argon; the other was a log K against 1/T plot. The compiler took log K values from the points on the second graph to obtain the Henry's constant values given in the Table above. The compiler calculated the mole fraction solubility of He in liquid Ar at pressures of one and 76 cmHg from Henry's law. The Henry's constant is K/cmHg = (P <sub>1</sub> /cmHg)/X <sub>1</sub> .				
AUXILIARY INFORMATION				
METHOD:		SOURCE AND PURITY OF MATER	IALS:	
A measured amou	nt of helium gas was	1. Helium. Air Reducti	on Co. Used as	
placed in the cel amount of liquid	l with a measured argon. The pressure	received in glass s	ealed bulbs.	
was recorded as a function of the		2. Argon. Air Reductio	on Co. Used as	
function of tempe	rature (isostere).	reference compartme	ent. The actual	
Only the results runs are given ab	from the isotherm ove.	solvent was tank ar with titanium metal	gon purified	
		ESTIMATED ERROR:		
APPARATUS/PROCEDURE:	al call with and	$\delta T/K = \delta P/G P/G P/G = \delta P/G P/G P/G P/G P/G P/G P/G P/G P/G P/G$	0.01	
compartment for t	he solution and one	$\delta x_1 / x_1 =$	0.001	
compartment conta	ining pure liquid			
mounted so that m	ovement in one	REFERENCES:		
tated the solutio	n. The argon vapor	Ind. Eng. Chem. 19	50, <u>42</u> , 2045.	
pressure checked values (1).	with literature			
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COMPONENTS:		···· ··· ···· ···· ···· ····	ORIGINAL	MEASUREMENTS:	
l. Helium; He; 7440-59-7		Chang,	E. T.; Gokcen,	N. A.	
2. Nitrogen Oxide; N <sub>2</sub> O <sub>4</sub> ; 10544-72-6				i	
			J. Phys	<u>s. Chem</u> . 1966,	<u>70</u> , 2394-2399.
VARIABLES:			PREPARED	BY:	
n He H	C/K: 262.02 P/kPa: 39.0 (0.39	2 - 303.16 589 - 193.784 917 - 1.925 atm)		P. L. Long	
EXPERIMENTAL	VALUES:				
т/к	P/Atm	Henry's Mol Constant K x 10 X <sub>1</sub>	Fraction x 10 <sup>4</sup>	Bunsen Coefficient α x 10 <sup>2</sup>	Ostwald Coefficient L x 10 <sup>2</sup>
262.02	0.5261 1.0149 1.2393 1.8346 <u>1.9125</u> 1.0000	0.55 0.59 0.56 0.61 0.55	0.289 0.599 0.694 1.12 1.05 0.572	2.11	2.03
273.15	0.4951 0.6624 0.9566 1.2315 1.4186 1.8770	0.73 0.68 0.73 0.69 0.67 0.69	0.361 0.453 0.698 0.852 0.950 1.30		
	1.0000		0.698	2.54	2.54
288.10	0.9773 <u>1.3153</u> 1.0000	0.89 0.86	0.870 1.13 0.877	3.11	3.28
298.15	0.3917 0.3963 0.7836 1.0192 1.1195 1.1455	1.02 1.02 1.06 0.98 0.99 1.07	0.401 0.404 0.830 1.00 1.11 1.23		
	1.0000		1.02	3.57	3.89
		AUXILIARY	INFORMATI	ON	
METHOD: The solvent was degassed under vacuum in the previously weighed app- aratus. Apparatus and degassed solvent were weighed. Gas was introduced into the apparatus at a known P and T, the liquid stirred, and the pressure ob- served until there was no further change. Equilibrium was established within 10 m and the P was followed for 40 m.		SOURCE AN 1. Ho 2. N 9 g: Dr	ND PURITY OF MATER elium. No sour itrogen Oxide. 9.5% min. purit iven.	IALS: cce given. Research grade. y, source not	
APPARATUS/PROCEDURE: The apparatus was of all glass construction. It consisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer for measuring the pressure with a microslide cathetometer. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The appara- tus sections were calibrated to $\pm$ 0.0002-3 cm <sup>3</sup> .		ESTIMATE	D ERROR: $\delta T/K = 0.03$ $\delta P/mmHg = 0.01$ $\delta X_1/X_1 = 0.05$ ES:		

COMPONENTS:	ORIGINAL MEASUREMENTS:
l. Helium; He; 7440-59-7	Chang, E. T.; Gokcen, N. A.
2. Nitrogen Oxide; N <sub>2</sub> O <sub>4</sub> ; 10544-72-6	
	J. Phys. Chem. 1966, 70, 2394-2399.
VARIABLES:	PREPARED BY.
T/K: 262.02 - 303.16 He P/kPa: 39.689 - 193.784	P. L. Long
EXPERIMENTAL VALUES:	
T/K P/Atm Henry's Mol H Constant K x 10 <sup>4</sup> X <sub>1</sub> x	$ \begin{array}{cccc} & \text{Bunsen} & \text{Ostwald} \\ \text{Coefficient} & \text{Coefficient} \\ 10^4 & \alpha \times 10^2 & \text{L} \times 10^2 \end{array} $
303.16 0.5759 1.07 0.61 <u>0.8867 1.03 0.90</u>	L5 09
1.0000 1.05	5 3.64 4.04
The Henry's constant is defined as K/a one atm were calculated from the avera Smoothed Data: The 101.325 kPa (1 atm)	$x_{1}^{-1} = X_{1}/P$ . The solubility values at age Henry's constant by the compiler. mole fraction solubilities were
fitted to: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln 2$	$K_1 = 9933.2 + 43.241 \text{ T}$
Std Dev $AG^{\circ} = 35.5$	$\frac{1}{2}$
$\Delta H^{\circ}/J \text{ mol}^{-1} = 9933.2,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -43.241$
T/K Mol Fract	tion ΔG°/J mol <sup>-1</sup>
$\frac{X_1 \times 10}{252.15}$	
	B 21,312
268.15 0.640	21,528
273.15 0.69	5 21,745
278.15 0.75	1 22,177
288.15 0.872	2 22,393
	22,609
303.15 1.07	23,042
AUXILIARY	23.258 INFORMATION
METHOD	SOURCE AND PURITY OF MATERIALS.
	BOOKEL AND FORTH OF IMILATED.
See preceding page.	See preceding page.
APPARATUS / PROCEDURE :	ESTIMATED ERROR:
See preceding page.	See preceding page.
	DEEDENCES.
	REFERENCED :
	See preceding page.

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COMPONENTS:			ORIGINAL MEASUREMENTS:				
1. Helium; He; 7440-59-7			Chang, E.T.; Gokcen, N.A.; Poston, T.M.				
2. Hydrazine; H <sub>4</sub> N <sub>2</sub> ; 302-01-2			1 2 2				
			J. Phy	<u>s. Chem</u> . 1968	, <u>72</u> , 638 - 642.		
UARTABLES.				DDEDADI			
T/	/K: 278.15	- 308.18		T KEFAKI		na	
He P/k	CPa: 110.46	5 (1.09 At .757 (2.30	.m) - 7 Atm)		1. 1. 10		
EXPERIMENTAL	VALUES:						
т/к	P/Atm	Henry's Constant K x 10 <sup>5</sup>	Mol Fra	iction 10 <sup>4</sup>	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient L x 10 <sup>2</sup>	
278.15	1.2333	0.41	0.05	1			
]	$\frac{2.1927}{1.0000}$	0.49	0.10	5	0.321	0.327	
293.16	1.1411	0.46	0.05	2			
	2.0451	0.54	0.11	.0	0.252	0.270	
200.10	1.0000		0.05		0.352	0.378	
308.18	1.0902	0.52	0.05	57 58			
	1.9941	0.59	0.11	.7			
l l	$\frac{2.3070}{1.0000}$	0.62	0.14	4 6	0.390	0.439	
		in define	2 1/-	+ <b>-</b> 1	v (D The se	]	- 1
one atm we	ere calcula	ted from t	he avera	icm = = ige Hen	ry's constant	by the compiler	at
	Mol Fractic		1 s	moothe	d Data: The l	01.325 kPa (1 at:	m)
	$x_1 \times 10^4$		n f	ole fr	action solubi	lities were	
278.15	0.045	28,47	9 <sup>1</sup>			¥.	
288.15	0.0485	29,31	.6		= 5198.0	+ 83.701T	
293.15	0.050	29 <b>,</b> 73	5 3 S	td Dev	$\Delta G^{O} = 13.4$	Coef. Corr.= 0.9	999
303.15	0.054	30,57	2 A	Ho/J m	$101^{-1} = 5198.0$		
308.15	0.056	30,99 31,40	0		∆s°/j	$K^{-1} mol^{-1} = -83.$	701
	0.050	51/40					
			AUXILIARY	INFORMA	TION		
METHOD: The	solvent wa	s degassed	under	SOURCE	AND PURITY OF M	ATERIALS:	
aratus. Ap	pparatus an	d degassed	solvent	1. He	lium. No info	rmation given.	
weighed. (	Gas was int	roduced in	to the	2. ну	drazine.No in	formation on sour	rce.
uid was st	irred, and	the press	ure was	It	was freshly (	distilled before	and
observed u	until there	was no fu ted hydraz	rther	fi	tted to the e	quation:	
appear to	decompose	with	11169	ρ/	$g m 1^{-1} = 1.02$	492 - 0.000865t/0	c.
time. Wher	n this happ	ened the p	ressure				
the solubi	ility value	was corre	cted for	•			
the preser	nce of the	gaseous de	composi-	1			
ADDADATUS (DI		2002824110	was of	ESTIMA	TED ERROR:	= 0 03	
all glass	constructi	on. It con	sisted		δP/mmH	g = 0.01	
of three of	alibrated	volumes fo	r the		δX1/X1	= 0.05	
for the so	olvent, which	h was stir	red with			······	
a glass er	nclosed mag	net, and a	mano-	REFERE	NCES:	koon NA	
a microsli	ide catheto	meter.The	solvent	J.	Phys. Chem.	1966, <u>70</u> , 2394.	
container	had a capa	city for 1	00 g of				
the liquid	l surface.I	the apparat	us sec-				
cm <sup>3</sup> (1).	e calibrate	d to <u>+</u> 0.0	002-3	ļ			
1 .=, .				1			

COMPONENTS :		ORIGINAL MEASUREME	ENTS:				
1 Holins Has 2440 50	- 7	Logvinyuk, V.P.; Makarenkov, V.V.;					
1. Hellum; He; /440-59	-/	Malysnev, V.	Malyshev, V.V.; Panchenko, G.M.				
2. Hydrogenated Fuel		<u>Khim. Tekhnol.</u> <u>15(5), 27 -</u>	<u>Khim. Tekhnol. Topl. Masel</u> 1970, <u>15(5), 27 - 29.</u>				
		<u>Chem</u> . <u>Technol</u> . sl.) 1970, <u>15</u> ,	Fuels Oils (Engl.tran- 353 - 355.				
/ARIABLES:		PREPARED BY:					
T/K: 293.15 He P/kPa: 101.325	(1 atm)	S.A	Johnson				
EXPERIMENTAL VALUES:							
T/K Bunsen Coefficient α x 10 <sup>2</sup>		Ostwald nt Coefficient L x 10 <sup>2</sup>					
293	.15 2.1	2.3					
	AUXILIAR	Y INFORMATION					
METHOD:	AUXILIAR	Y INFORMATION SOURCE AND PURITY	OF MATERIALS:				
METHOD: Described in reference	AUXILIAR (1).	Y INFORMATION SOURCE AND PURITY 1. Helium. No	OF MATERIALS: information given.				
METHOD: Described in reference	AUXILIAR (1).	Y INFORMATION SOURCE AND PURITY 1. Helium. No 2. Hydrogenate given. Dens	OF MATERIALS: information given. d Fuel. Source not ity/g cm <sup>-3</sup> 0.832.				
METHOD: Described in reference	AUXILIAR (1).	Y INFORMATION SOURCE AND PURITY 1. Helium. No 2. Hydrogenate given. Dens ESTIMATED ERROR:	OF MATERIALS: information given. d Fuel. Source not ity/g cm <sup>-3</sup> 0.832.				
METHOD: Described in reference APPARATUS/PROCEDURE:	AUXILIAR (1).	Y INFORMATION SOURCE AND PURITY 1. Helium. No 2. Hydrogenate given. Dens ESTIMATED ERROR: 6L/L	OF MATERIALS: information given. d Fuel. Source not ity/g cm <sup>-3</sup> 0.832.				
METHOD: Described in reference APPARATUS/PROCEDURE: No description given.	AUXILIAR (1).	Y INFORMATION SOURCE AND PURITY 1. Helium. No 2. Hydrogenate given. Dens ESTIMATED ERROR: $\delta L/L$	OF MATERIALS: information given. d Fuel. Source not ity/g cm <sup>-3</sup> 0.832.				

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COMPONENTS:	ORIGINAL MEASUREMENTS:				
1. Helium; He; 7440-59-7	Steinberg, M.; Manowitz, B.				
2. Amsco 123-15					
	<u>Ind. Eng</u> . <u>Chem</u> . 1959, <u>51</u> , 47 - 51.				
VARIABLES:	PREPARED BY:				
T/K: 218.15 - 297.15	H.L.Clever				
P/kPa: 101.325 (1 atm)					
EXPERIMENTAL VALUES:					
T/K Absor Coeff	ption icient*				
	102				
218.15 6 297.15 4	• • 6 • • 3				
*The authors define the absorption coe corrected to 288.15 K and 101.325 kPa pressure of 101.325 kPa (1 atm) per un 288.15 K. The authors incorrectly iden an Ostwald coefficient.	efficient as the volume of gas, (1 atm),absorbed under a total system hit volume of solvent,corrected to htify their absorption coefficient as				
AUXILIARY INFORMATION					
METHOD: Van Slyke method (1).	SOURCE AND PURITY OF MATERIALS:				
	1. Helium. No information given.				
	2. Amsco 123-15. American Mineral				
	The composition is stated to be				
	59.6 wt % paraffin, 27.2 wt % naphthene, and 13.2 wt %				
	aromatics.				
	ESTIMATED ERROR:				
APPARATUS/PROCEDURE:	10 per cent.				
	REFERENCES				
	1. Van Slyke, D.D.				
	<u>J. Biol. Chem. 1939, 130, 545.</u>				
	Van Slyke, D.D.; Neill, J.M. J. <u>Biol</u> . <u>Chem</u> . 1924, <u>61</u> , 523.				
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COMPONENTS:	ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7	Burrows, G.; Preece. F. H.			
2. Apiezon GW oil				
	J. Appl. Chem. 1953, 3, 451 - 462.			
VARIABLES:	PREPARED BY:			
T/K: 293.15 - 356.15 He P/kPa: 101 325 (1 atm)	P. L. Long			
EXPERIMENTAL VALUES:				
T/K Bunsen	Ostwald -log L			
$\begin{array}{c} \text{Coefficient} \\ \alpha \times 10^2 \end{array}$	L x 10 <sup>2</sup>			
293.15 1.33	1.43 1.846			
	1.57 1.805 1.63 1.789*			
307.15 1.82	2.05 1.689			
320.65 2.27	2.67 1.574			
321.65 2.26	2.67 1.574 3.31 1.480			
342.15 2.64	3.30 1.481			
355.15 2.85	3.71 $1.431$			
556.15 2.76	5.00 1.111			
AUXILIARY	INFORMATION			
METHOD: Volumetric. Helium gas and	SOURCE AND PURITY OF MATERIALS:			
solvent brought into contact. The solvent stirred until Hg levels in helium buret indicate no more absorp- tion of gas.	<ol> <li>Helium. Source not given. 99.8 per cent purity.</li> <li>Apiezon GW oil.</li> </ol>			
The density, viscosity, and surface tension of the solvent was determined at temperatures of 293.15, 313.15, 333.15, and 353.15 K. The 293.15 K values are given in the Source and Purity of Materials.	density/g cm <sup>3</sup> 0.878 viscosity/cpoise 160.5 surface tension/ 31.7 dyne cm <sup>-1</sup> Above properties at 293.15 K.			
	ESTIMATED ERROR:			
APPARATUS/PROCEDURE: The mixing chamber was all glass with a capacity of 306 cm <sup>3</sup> . Stirring was accomplished by a magnetically driven disc. The solvent was degassed by boiling in a heated	δL/L = 0.05			
flask fitted with a water-cooled re- flux condenser. The degassed solvent was transferred to the mixing chamber evacuated to 0.005 mmHg without break- ing the vacuum. The helium and sol- vent were brought into contact at a predetermined temperature and pres-	REFERENCES:			

COMPONENTS .	OD TOTNAL MEASUDEMENTS .			
	Burrows, G.: Preece, F.H.			
1. Helium; He; 7440-59-7	Bullows, G., Fleece, F.n.			
2. Silicone Oils				
	<u>J. Appl. Chem</u> . 1953, <u>3</u> , 451 - 462.			
VARIABLES:	PREPARED BY			
T/K: 293.15 - 358.15				
He P/kPa: 101.325 (1 atm)	P.L.Long			
EXPERIMENTAL VALUES:				
T/K Bunsen	Ostwald -log L			
Coefficient C	coefficient			
$\propto x \ 10^2$	$L \times 10^2$			
Silicone oli, Dow Corr				
	3.11 1.507 3.33 1.479			
298-15 3 30	3.53 1.470 3.61 1.443*			
303.15 3.52	3.91 1.408			
318.15 3.80	4.43 1.354			
320.15 4.36	5.10 1.292			
337.15 4.80	5.93 1.227			
339.65 4.79	5.96 1.225			
357,15 4,90	6.41 1.193			
Silicono oil Dow Corr	ving 702			
294.15 1.55	1.74 1.760*			
303.15 1.65	1.83 1.737			
319.15 2.05	2.40 1.620			
326.15 1.99	2.38 1.624			
	2.97 $1.527$			
358.15 2.37	3.11 1.507			
The authors reported the helium solubi	lities as -log(Ostwald coefficient),			
the compiler calculated Bunsen and Ost	wald coefficients from the log L.			
I * The -log L value is from a graphical	interpolation by the authors.			
AUXILIARY	INFORMATION			
METHOD: Volumetric Helium gag and	SOURCE AND PURITY OF MATERIALS.			
solvent brought into contact. The	1 Helium Source not given 99.8			
solvent stirred until Hg levels in	per cent purity.			
helium buret indicate no more absorp-				
tion of gas.	2. Silicone Oils. DC 200 DC 702 dongitu/g $cm^{-3}$ 0 071 1 072			
The density viscosity and surface	viscosity/cpoise104.4 39.8			
tension of the solvent were determined	surface tension/ 26.7 29.1			
at temperatures of 293.15, 313.15,	dyne cm <sup>-1</sup>			
333.15, and 353.15 K. The 293.15 K	Above properties at 293.15 K.			
values are given in the Source and				
Purity of Materials.				
APPARATUS/PROCEDURE: The mixing Chamber	ESTIMATED ERROR:			
was all glass with a capacity of 306	$\delta L/L = 0.05$			
cm <sup>3</sup> . Stirring was accomplished by a				
magnetically driven disc. The solvent				
was degassed by boiling in a heated	REFERENCES :			
flux condenser. The decased solvent				
was transferred to the mixing chamber,				
evacuated to 0.005 mmHg, without break-				
ing the vacuum. The helium and solvent				
were prought into contact at a pre-				
decermined cemperature and pressure,				

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COMPONENTS:	
	ORIGINAL MEASUREMENTS:
l. Helium; He; 7440-59-7	Behnke, A.R.; Yarbrough, O.D.
2. Olive Oil	
	II S Naval Med Bull 1938 36 542-
	548.
VARIABLES:	PREPARED BY:
T/K: 311.15 P/kPa: 101.325 (1 atm)	P.L.Long
EXPERIMENTAL VALUES:	
	Ostwald
Coefficien a x 10 <sup>2</sup>	t Coefficient L x 10 <sup>2</sup>
211.15 1.400	
1.489	
1.477	
_1.467_	
1.48 Av	. 1.69
Pressure is 101.325 kPa (1 atm).	
The Ostwald coefficient was calculated	d by the compiler.
AUXILIARY	
METHOD:	INFORMATION
	INFORMATION SOURCE AND PURITY OF MATERIALS:
Gas-liquid equilibrium was establish-	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H <sub>o</sub> SO, and pyrogallic acid to re-
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H <sub>2</sub> SO <sub>4</sub> and pyrogallic acid to re- move O <sub>2</sub> and CO <sub>2</sub> . Dried.
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H<sub>2</sub>SO<sub>4</sub> and pyrogallic acid to re- move O<sub>2</sub> and CO<sub>2</sub>. Dried. 2. Olive oil. Source not given. U.S.P.</pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<ul> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. Source not given. 97.65 per cent pure. Passed through H<sub>2</sub>SO<sub>4</sub> and pyrogallic acid to re- move O<sub>2</sub> and CO<sub>2</sub>. Dried.</li> <li>2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % cleip and 28 % palmitin</li> </ul>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<ul> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. Source not given. 97.65 per cent pure. Passed through H<sub>2</sub>SO<sub>4</sub> and pyrogallic acid to re- move O<sub>2</sub> and CO<sub>2</sub>. Dried.</li> <li>2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin.</li> </ul>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<ul> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS: <ol> <li>Helium. Source not given. 97.65 per cent pure. Passed through H<sub>2</sub>SO<sub>4</sub> and pyrogallic acid to remove O<sub>2</sub> and CO<sub>2</sub>. Dried.</li> </ol> </li> <li>Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin.</li> </ul>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<ul> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS: <ol> <li>Helium. Source not given. 97.65 per cent pure. Passed through H<sub>2</sub>SO<sub>4</sub> and pyrogallic acid to remove O<sub>2</sub> and CO<sub>2</sub>. Dried.</li> <li>Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin.</li> </ol> </li> </ul>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO_and pyrogallic acid to re- move O_2 and CO_2. Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR:</pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO4 and pyrogallic acid to re- move O2 and CO2. Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR:</pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours. APPARATUS/PROCEDURE: After establishment of equilibrium the gas was extracted from the sat-	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO_ and pyrogallic acid to re- move O_ and CO Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR:</pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours. APPARATUS/PROCEDURE: After establishment of equilibrium the gas was extracted from the sat- urated solution in vacuo by repeat- ed shaking in a Van Slyke apparatus.	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO_ and pyrogallic acid to re- move O_ and CO Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR: </pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours. APPARATUS/PROCEDURE: After establishment of equilibrium the gas was extracted from the sat- urated solution in vacuo by repeat- ed shaking in a Van Slyke apparatus. The procedure and calculations were	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO4 and pyrogallic acid to re- move O2 and CO2. Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR: REFERENCES: </pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours. APPARATUS/PROCEDURE: After establishment of equilibrium the gas was extracted from the sat- urated solution in vacuo by repeat- ed shaking in a Van Slyke apparatus. The procedure and calculations were similar to those developed by Van Slyke (1,2).	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO_and pyrogallic acid to re- move O_2 and CO_2. Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR: REFERENCES: 1. Van Slyke, D.D.; Stadie, W.C. J. Biol. Chem. 1021, 56, 765.</pre>
Gas-liquid equilibrium was establish- ed at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours. APPARATUS/PROCEDURE: After establishment of equilibrium the gas was extracted from the sat- urated solution in vacuo by repeat- ed shaking in a Van Slyke apparatus. The procedure and calculations were similar to those developed by Van Slyke (1,2).	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO4 and pyrogallic acid to re- move O2 and CO2. Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR: REFERENCES: 1. Van Slyke, D.D.; Stadie, W.C. J. Biol. Chem. 1021, 56, 765. 2. Van Slyke, D.D.; Dillon. R.T.:</pre>
Gas-liquid equilibrium was established at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours. APPARATUS/PROCEDURE: After establishment of equilibrium the gas was extracted from the saturated solution in vacuo by repeated shaking in a Van Slyke apparatus. The procedure and calculations were similar to those developed by Van Slyke (1,2).	<pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 97.65 per cent pure. Passed through H_SO_and pyrogallic acid to re- move O2 and CO2. Dried. 2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin. ESTIMATED ERROR: REFERENCES: 1. Van Slyke, D.D.; Stadie, W.C. J. Biol. Chem. 1021, 56, 765. 2. Van Slyke, D.D.; Dillon, R.T.; Margaria, R. J. Diol. Chem. 1024, 105, 571</pre>

COMPONENTS :	ODICINAL MEASUDEMENTS.					
	Battino R · Fyans F D ·					
1. Helium; He; 7440-59-7	Danforth, W. F.					
2. Olive Oil						
	J. Am. Oil Chem. Soc. 1968, 45,					
	830 - 833.					
VARIABLES:	DEEDADED BY.					
<b>Т/К: 297.84 - 327.93</b>	H. L. Clever					
P/kPa: 101.325 (1 atm)						
EXPERIMENTAL VALUES:						
T/K Mol Fraction	Bunsen Ostwald					
$x_1 \times 10^4$	$\alpha \ge 10^2$ L $\ge 10^2$					
$\frac{1}{207.84}$ $\frac{1}{7.01}$ -	1.60 1.75					
307.86 6.88	1.57 1.76					
317.98 6.61	1.49 1.74					
327.93 6.47	1.45 1.75					
Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$	$X_1 = -2273.7 + 67.990 T$					
Std. Dev. AG° = 13.9,	Coef. Corr. = 0.9999					
$\Delta H^{\circ}/J \text{ mol}^{-1} = -2273.7,$	$\Delta S^{\circ}/J K^{-1} mol^{-1} = -67.990$					
X <sub>1</sub> x 10	4					
293 15 7 14						
298.15 7.03	17,998					
303.15 6.92	18,338					
308.15 6.82	18,678					
318.15 6.64	19,357					
323.15 6.55	19,697					
328.15 6.46	20,037					
The solubility values were adjusted to a partial pressure of helium of						
101.325 kPa (1 atm) by Henry's law.						
The Bunsen coefficients were calculate	ed by the compiler.					
AUXILIARY	INFORMATION					
METHOD: The apparatus is based on the	SOURCE AND PURITY OF MATERIALS:					
design by Morrison and Billett (1)	l. Helium. Matheson Co., Inc.					
and the version used is a modification	99.9995 Min. Vol % Purity.					
Saylor, and Gross (2).	2. Olive Oil. A. U.S.P., Fisher					
	acid.					
	B. Nutritional Biochemicals					
	Corp., 0.30% free fatty acid.					
	The density was measured and					
	= 0.9152 - 0.000468t/C. The aver-					
APPARATUS/PROCEDURE: Degassing.	age mol wt is $884 \pm 45$ .					
The solvent is sprayed into an evacu-	ESTIMATED ERROR:					
tus: it is stirred and heated until	$\delta T/K = 0.03$					
the pressure drops to the vapor	$\delta P/mmHg = 0.5$ $\delta X_1/X_1 = 0.03$					
pressure of the liquid. Solubility	0.1T 0.02					
passes in a thin film down a glass	REFERENCES :					
spiral tube at a total pressure of	1. Morrison, T. J.; Billett, F.					
one atm of solute gas plus solvent	J. <u>Chem</u> . <u>Soc</u> . 1948, 2033.					
vapor. The gas absorbed is measured	2. Clever, H. L.; Battino, R.;					
solvent is collected in a tared	Saylor, J. H.; Gross, P. M.					
flask and weighed.	J. Phys. Chem. 1957, 61, 1078.					

COMPONENTS :	ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7	Cander, L.			
2. Human Lung Homogenate				
	J. Appl. Physiol. 1959, 14, 538 - 540.			
VARIABLES:	PREPARED BY:			
T/K: 310.15 He P/kPa: 101.325 (1 atm)	P.L.Long, A.L.Cramer			
EXPERIMENTAL VALUES:	sen Ostwald			
Coeff « x	icient Coefficient $10^2$ L x $10^2$			
310.15 0.	92 1.04			
0. 0.	90 1.02 94 1.07			
0.	94 1.07			
The four values from four deceas	are for lung samples ed patients who had no			
history of acute The mean Bunsen	or chronic lung disease. coefficient is 0.0092 with			
a range of ± 2 p	er cent.			
The Ostwald coefficients were calcula	ted by the compiler.			
AUXILIARY	INFORMATION			
METHOD: Lung sample were obtained from	SOURCE AND PURITY OF MATERIALS:			
deceased patients. The lung was re- moved, perfused with isotonic saline	<ol> <li>Helium. Matheson Co., East Rutherford, NJ.Pure grade.</li> </ol>			
until blood free, minced, blended, and homogenized. The homogenate was press-	] 2. Human Lung Homogenate. Lung from			
ed through several layers of gauze to	four deceased patients who had no history of acute or chronic lung			
tissue. The fluid homogenate was	disease. See Method for details			
deaerated.	of preparation.			
	POTIMATED EDDOD.			
APPARATUS/PROCEDURE: The manometric Van	Reproducibility was ± 2 percent.			
Slyke apparatus was used. The tissue homogenate was equilibrated for five				
minutes by shaking. Excess gas was				
extracted (1).	1. Van Slyke, D.D.; Neill, J.M.			
	J. Biol. Chem. 1924, 61, 523.			

COMPONENTS:	ORIGINAL MEASUREMENTS:				
1 Holium, Hos 7440-50-7	Campos Carles, A.;Kawashiro, T.; Piiper, J.				
2. Pat Abdominal Musclo					
2. Rat Abdominal Muscle					
	<u>Pflugers Arch</u> . 1975, <u>359</u> , 209 - 218.				
VARIABLES:	PREPARED BY:				
T/K: 310.15	A.L.Cramer				
EXPERIMENTAL VALUES:					
T/K Solubility Co	prrected Bunsen				
Coefficient So	lubility Coefficient				
Amol 1 <sup>-1</sup> torr <sup>-1</sup> Am	$\propto 10^{2}$				
310.15 0.521 ± 0.012 <sup>*</sup>	0.608 1.03				
*Mean value and standard error of 13 measurements. The corrected solubility coefficient and the Bunsen coefficient were corrected for unextracted gas in the sample and for gas lost during transfer of the sample. Another report (1) from this Laboratory gives Krogh's diffusion constant, K = 1.42 ± 0.02, and the diffusion coefficient, D = 39.0, for helium in rat abdominal muscle at 310.15 K.					
AUXILIARY	INFORMATION				
METHOD: The helium gas was presaturated with water vapor, then passed through	SOURCE AND PURITY OF MATERIALS:				
with water vapor, then passed through an equilibration chamber containing the muscle sample resting on a screen to expose all sides. The gas was passed through the equilibration cham- ber for one hour at a rate of 8 ml m <sup>-1</sup> The muscle was transferred to an ex- traction chamber filled with air, for the same length of time as equilibra- tion. The gas in the extraction chamber was then forced into a gas chromatograph by mercury entering the chamber.	<ol> <li>Helium. No source given. Purity better than 99.9 per cent.</li> <li>Rat Abdominal Muscle. Flat abdom- inal wall muscle layer of about 1.6 g, 1.4 mm thickness, and sur- face area of 10 cm<sup>2</sup> on one side taken from 250 - 430 g rat.</li> </ol>				
APPARATUS/PROCEDURE:	ESTIMATED ERROR:				
	REFERENCES :				
	<pre>1. Kawashiro, T.;Campos Carles, A.; Perry, S.F.; Piiper, J. Pflugers Arch. 1975, 359, 219.</pre>				

COMPONENTS:	ORIGINAL MEASUREMENTS:				
l. Helium; He; 7440-59-7	Lange, P.; Nyström, O.; Röckert, H.				
2. Water; H <sub>2</sub> O; 7732-18-5					
<ol> <li>Components of infusion solutions, and some other mixtures.</li> </ol>	<u>Foersvarsmedicin</u> 1975, <u>11</u> , 230 - 234.				
VARIABLES:	PREPARED BY:				
He P/kPa: 607.950 (6 atm)	H.L.Clever				
EYDEDIMENTAL VALUES.					
EXPERIMENTAL VALUES:	- No Standard Number of Ostwald				
$\begin{array}{c} \underline{cm} & 0 \\ \text{Liquid} & cm^3 & \text{of} \\ & & x & 10 \end{array}$	$\begin{array}{c} \underline{\text{Liq}} & \underline{\text{Standard}} & \underline{\text{Number Of}} & \underline{\text{Ostward}} \\ \underline{\text{Liq}} & \underline{\text{Error of}} & \underline{\text{Determina-}} & \underline{\text{Coefficient}} \\ \underline{\text{O}^2} & \underline{\text{the Mean}} & \underline{\text{tions}} & \underline{\text{L x 10}^2} \\ \end{array}$				
Blood with added ascorbic acid, 4 citrate, and dextrose.	0.6 11 0.8				
Water + 0.9 wt % NaCl 4	0.7 8 0.8				
Macrodex with NaCl (Pharmacia), 2 100 ml contain 6 g Dextran 70, and 0.9 g NaCl.	0.6 10 0.4				
Macrodex with glucose (Pharm- 3 acia), 100 ml contain 6 g Dextran 70, and 5 g glucose.	0.1 6 0.6				
Rheomacrodex with NaCl (Pharm- 2 acia), 100 ml contain 10 g Dextran 70, and 0.9 g NaCl.	0.4 11 0.4				
Rheomacrodex with glucose (Pharm- 4 acia), 100 ml contain 10 g Dex- tran 70, and 5 g glucose.	0.1 5 0.8				
Aminosol 10% (Vitrum), 100 ml 2 contain 10 g amino acids and low mol wt peptides obtained by enzymatic hydrolysis and dialysis of casein.	0.2 10 0.4				
Table continued on next page.					
AUXILIARY	INFORMATION				
METHOD /APPARATUS/PROCEDURE: The solv- ent was kept under 6 atm absolute pressure of the gas for seven hours while constantly agitated with a mag- netic stirrer. The gas evolved on de- compression from 6 to 1 atm was meas- ured by one of two methods. A. The solution under pressure was transferr to a closed pipet. The pressure was	SOURCE AND PURITY OF MATERIALS: 1. Helium. No information given. 2. Solvents. Information in text above. ed				

ESTIMATED ERROR:

δL/L ≥ 0.25

**REFERENCES:** 

decreased from 6 to 1 atm, and the gas evolved from the known solution volume was measured in a calibrated part of the pipet (1). B. The gas that collected in an inverted test

tube from a known volume of the saturated solution on decompression from 6 to 1 atm was measured by mercury

There was no mention of either degassing the solvent or of the temperature of the measurement in the

The compiler estimated an Ostwald coefficient by assuming a 5 atm pressure change and dividing (v gas/v solvent) x 100 by 500. The results are useful only as relative solubilities in solvents reported in this paper.

displacement.

paper.

1.	Lange, P.W.; Martinsson,	A.;	
	Rockert, H.O.E.		
	"Underwater Physiology"		
	Lambertsen, C. J., Editor		
	Academic Press, NY, 1971,	p.	239.

				<u></u>		
COMPONENTS :			ORIGINAL MEASUREMENTS:			
1. Helium; He; 7440-59-7			je, P.; N	ystrom, U.;	ROCKETT, H.	
2. Water; H <sub>2</sub> O; 7732-18-5					_	
3. Components of infusion solutions and some other mixtures.	5,	<u>Foe</u>	rsvarsmed:	<u>icin</u> 1975, <u>1</u>	<u>1</u> , 230 - 234	ł.
VARIABLES:		PREPA	RED BY:		puget	
T/K: No information given.			н.	L.Clever		
EXPERIMENTAL VALUES:						
Liquid Cm	$\frac{n^3 \text{ of}}{3 \text{ of}}$	E He Liq 0 <sup>2</sup>	Standard Error of the Mean	Number Determina- tions	Ostwald Coefficient L x 10 <sup>2</sup>	:
Vamin N (Vitrum), 100 ml contain a total of 6.995 g of 18 differ- ent amino acids. See complete list below.*	5		0.5	10	1.0	
Intralipid 20% (Vitrum), 100 ml contain 20 g fractionated soy- bean oil, 12 g fractionated egg lecithin, and 25 g dilute glycerol (Ph. Int.).	6		0.3	11	1.2	
Water + 5.5 wt % glucose.	5		0.1	5	1.0	
Water + 20 wt % fructose.	2		0.3	10	0.4	
Ethanol, 99.5 %.	9		0.6	11	1.8	
* 100 ml Vamin N contain: L-Alanine 0.300 g L-Histin L-Arginine 0.330 g L-Isole L-Aspartic acid0.405 g L-Leuci L-Cysteine and L-Lysin L-Cystine 0.140 g L-Methi L-Glutamic acid0.900 g L-Pheny Glycine 0.210 g L-Proli	dine ucin e onin lala ne	e e nine	0.240 g 0.390 g 0.525 g 0.385 g 0.190 g 0.545 g 0.810 g	L-Serine L-Threonin L-Tryptoph L-Tyrosine L-Valine	0.750 g e 0.300 g an 0.100 g 0.050 g 0.425 g	
AUXILI	ARY 1	INFOR	MATION			_
METHOD:		SOURC	E AND PURI	TY OF MATERIALS	5:	
See previous page.			See pre	vious page.		
			x			
		ESTIN	ATED ERROR	:		
		REFE	RENCES:			
L						_

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COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9	Rubin Battino Department of Chemistry
2. Water; H <sub>2</sub> O; 7732-18-5	Wright State University Dayton, Ohio 45431 USA
	May 1977

CRITICAL EVALUATION:

The experimental solubility data produced by nine workers were considered to be sufficiently reliable to use for the smoothing equation. In fitting the data to the equation, those points which differed by about two standard deviations or more from the smoothed values were rejected. We thus used 59 points which were obtained as follows (reference - number of data points used from that reference): 1-9; 2-8; 3-20;4-2; 5-10; 13-3; 14-4; 15-2; 16-1. The fitting equation used was

 $\ln X_1 = A + B/(T/100K) + C \ln (T/100K) + DT/100K$ (1)

Using T/100K as the variable rather than T/K gives coefficients of approximately equal magnitude. The best fit for the 59 data points gave

 $\ln X_1 = -52.8573 + 61.0494/(T/100K) + 18.9157 \ln (T/100K)$  (2)

where  $X_1$  is the mole fraction solubility of neon at 101.325 kPa (1 atm) partial pressure gas. The fit in  $\ln X_1$  gave a standard deviation of 0.47% taken at the middle of the temperature range. Table 1 gives smoothed values of the mole fraction solubility at 101.325 kPa (1 atm) partial pressure of gas and the Ostwald coefficient at 5K intervals.

Table 1 also gives the thermodynamic functions  $\Delta \overline{G}_1^\circ$ ,  $\Delta \overline{H}_1^\circ$ ,  $\Delta \overline{S}_2^\circ$ , and  $\Delta \overline{C}^\circ$  for the transfer of gas from the vapor phase at 101.325 kPa partial gas  $p_1$  pressure to the (hypothetical) solution phase of unit mole fraction. These thermodynamic properties were calculated from the smoothing equation according to the following equations:

$\Delta \overline{G}_{1}^{\circ} = - RAT - 100RB - RCT ln (T/100) - RDT^{2}/100$	(3)
$\Delta \overline{S}_{1} = RA + RC \ln (T/100) = RC + 2RDT/100$	(4)
$\Delta \overline{H}_{1}^{\circ} = -100 \text{ RB} + \text{RCT} + \text{RDT}^{2}/100$	(5)
$\Delta \overline{C}^{\circ}_{P_1} = RC + 2RDT/100$	(6)

Several sets of data from other workers were rejected for various reasons. Ikel's data (6) was 3% too low. König's experimental points were all about 6% too low (7). Antropoff's data (8) ranged from a few percent low to very high values at the higher temperatures he investigated. Clever, et al.'s single test value (9) was 5% low. The data of Krestov and Patsatsiya (10) were between 6 and 13% low. This was also the case for another set of data by Krestov (11). The values of Borina, et al. (12) were low. Strakhov, et al. (17) had measurements which were 1.4% low, but showed a high reproducibility (0.2%). An independent set of measurements by the same group (18) was about 5% high. In general, values which are too low result from poor equilibration, a most common source of error in gas solubility determinations.

Figure 1 shows the temperature dependence of solubility for neon. The points were obtained from the smoothing equation. There is a pronounced minimum at about 323 K.

No report of the partial molal volume of neon in water was found. Alexander (19) measured the enthalpy of solution of neon in water at 298.15 K and reported values of -3.8, -4.6, -8.8, and -6.7 kJ mol<sup>-1</sup>, average  $-5.8_5 \pm 1.7$  kJ mol<sup>-1</sup>. The average calorimetric enthalpy of solution and the enthalpy of solution from the fit of the least square equation of -3.868 kJ mol<sup>-1</sup> differ by just a little more than the estimated experimental error. The agreement is considered satisfactory.



COMPONENTS: EVALUATOR: Neon; Ne; 7440-01-9 1. Rubin Battino Department of Chemistry 2. Water; H<sub>2</sub>O; 7732-18-5 Wright State University Dayton. Ohio 45431 USA May, 1977 CRITICAL EVALUATION: References Morrison, T. J.; Johnstone, N. B. J. Chem. Soc. 1954, 3441. Lannung, A. J. Am. Chem. Soc. 1930, 52, 68. Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235. de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9. Benson, B. B.; Krause, D. J. Chem. Phys. 1976, 64, 689. Ikels, K. G. DDC, Report No. SAM-TDR-64-28 1964. König, H. Z. Naturforsch. 1963, 18a, 363. von Antropoff, A. Proc. R. Soc. London 1910, 83, 474; Z. Elektrochem. 1919, 25, 269. 1. 2. 3. 4. 5. 6. 7. 8. Z. Elektrochem. 1919, 25, 269. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 9. 1957, <u>61</u>, 1078. 10. Krestov, G. A.; Patsatsiya, K. M. Russ. J. Phys. Chem. (Eng. Transl.) 1971, <u>45</u>, 1000. Krestov, G. A.; Patsatsiya, K. M. Izv. Vyssh. Uchebn. Zaved., Khim. 11. <u>Khim. Tekhnol.</u> 1969, <u>12</u>, 1333; <u>Chem. Abstr.</u> 1970, 72, 71204s. Borina, A. F.; Lyashchenko, A. K. <u>Russ. J. Phys. Chem. (Engl. Transl.)</u> 1972, <u>46</u>, 150. 12. 13. Borina, A. F. <u>Zh. Fiz. Khim. 1977, 51, 138.</u> Borina, A. F. Zh. Fiz. Khim. 1977, 51, 406. Borina, A. F.; Samoilov, O. Ya. Zh. Strukt. Khim. 1974, 15, 395. Krestov, G. A.; Patsatsiya, G. M. Izv. Vyssh. Uchebn.Zaved., Khim. 14. 15. 16. Khim. Tekhnol. 1969, 12, 1333. Strakhov, A. N.; Krestov, G. A.; Abrosimov, V. K.; Badelin, V. G. 17. Zh. Fiz. Khim. 1975, 49, 1583. Abrosimov, V. K.; Strakhov, A. N.; Krestov, G. A. <u>Izv. Vyssh. Uchebn.</u> 18. Zaved., Khim. Khim. Tekhnol. 1974, 17, 1463. Alexander, D. M. J. Phys. Chem. 1959, 63, 994. 19.
COMPONENTS	
COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9	Lannung, A.
2. Water: $H_00 \cdot 7732 = 18 = 5$	
2. "acci, "20, 7752 10 5	
	T $M$ (how Sec. 1020 52 68 - 80
	<u>J. Am, Chem. 30C.</u> 1930, <u>52</u> , 88 - 80.
VARIABLES:	DEEVADED BA
т/К: 278.15 <b>-</b> 318.15	R. Battino
Ne P/kPa: 101.325 (1 atm)	
EXPERIMENTAL VALUES:	
T/K Mol Fract	lon Bunsen Coofficient
X <sub>1</sub> x 10 <sup>4</sup>	
278 15 0.09565	
278.15 0.09404	0.0117
278.15 0.09565	0.0119*
	0.0115
283.15 0.08924	0.0113*
293.15 0.08293	0.0103
293.15 0.08293	0.0103_
293.15 0.08454	0.0105*
298.15 0.08222	0.0102
310.15 0.07768	0.0096*
310.15 0.07929	0.0098
318.15 0.07630	0.0094*
<u>318.15</u> 0.07630	0.0094
The mole fraction solubility at 101.32 the gas. The mole fraction solubility *Solubility values which were used in the recommended values given in the c	25 kPa (1 atm) partial pressure of y was calculated by the compiler. the final smoothing equation for ritical evaluation.
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
Manometric/volumetric procedure.	l Noon Lindo
mercury. Gas uptake measured on gas	I. Neon. Linde.
buret.	<ol> <li>Water. Distilled. The specific conductivity was 2 x 10<sup>-7</sup>.</li> </ol>
APPARATUS/PROCEDURE:	ESTIMATED ERROR:
The apparatus is based on the design	$\delta m/K = 0.02$
of v. Antropoff (1). The entire	01/ K = 0.03
apparatus is designed to be shaken	
inside of a thermostat.	REFERENCES:
	1. v. Antropoff, A.
	<u>n. <u>Diektioonem</u>, 1919, <u>19</u>, 2091</u>
	<u>n</u> . <u>Dickeloonem</u> , 1919, <u>19</u> , 2091

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Morrison, T. J.; Johnstone, N. B. Water; H<sub>2</sub>O; 7732-18-5 2. J. Chem. Soc. 1954, 3441 - 3446. VARIABLES: PREPARED BY: т/к: 282.25 - 347.25 R. Battino EXPERIMENTAL VALUES: T/K Mol Fraction Mol Fraction TZK Kuenen Kuenen Coefficient Coefficient  $x_1 \times 10^4$ S x 10<sup>3</sup>  $X_1 \times 10^4$  $S \times 10^{3}$ 0.07645\* 11.7 9.40 282.25 0.09406 322.65 0.07728\* 0.09086 9.46 11.3 331.95 284.65 0.07721\* 0.08769 10.9 334.15 9.44 288.15 0.07825\* 292.95 0.08535 9.55 10.6 337.55 0.07813\* 0.08221\* 338.55 9.53 297.55 10.2 0.07851\* 301.95 0.08150 339.75 9.57 10.1 0.08019 9.93 345.65 0.08101 9.84 304.45 9.84 0.08108 305.25 0.08021 9.93 347.25 0.07686\* 9.48 315.25 The original paper reports the neon solubility in water,  $S_0$ , as cm<sup>3</sup> of neon at a partial pressure 760 torr, reduced to 760 torr and 273.15 K, dissolved by 1 kg water. The same solubility value is reported above as the Kuenen coefficient x  $10^3$  at a neon partial pressure of 101.325 kPa (1 atm) The mole fraction solubility at a neon partial pressure of 101.325 kPa (1 atm) was calculated by the compiler. \*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation. The authors fitted their solubility data to the equation  $\log_{10} S_0 =$ -59.412 + 2890/(T/K). AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The previously degassed solvent is 1. Neon. British Oxygen Co. Ltd. flowed in a thin film through the Spectroscopically pure. gas in a glass absorption spiral. Volume changes are measured in burets, 2. Water. No information given. ESTIMATED ERROR: **APPARATUS / PROCEDURE :** The apparatus described by Morrison and Billett (1) was used. **REFERENCES:** 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1952, 3819.

COMPONENTS:	ORIGINAL MEASUREMENTS:
	de Wet, W. J.
1. Neon; Ne; 7440-01-9	
2. Water: H_O: 7732-18-5	
	<u>J. S. Afr. Chem. Inst. 1964, 17, 9-13.</u>
VARIABLES:	PREPARED BY:
T/K: 291.35 - 306.55	R. Battino
P/kPa: 101.325 (1 atm)	
EXPERIMENTAL VALUES:	
T/K Mol Fract	ion Bunsen Coofficient
X1 x 10	$4 \qquad \alpha \times 10^2$
291.35 0.08290	
298.75 0.08143	* 0.0098
Mole fraction solubility at 101.325 k neon calculated by the compiler.	Pa (1 atm) partial pressure of the
* Colubility wolve which was word in t	he final empething equation for the
recommended solubility values given i	ne final smootning equation for the n the critical evaluation.
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
Decased liquid is flowed in a thin	1 Neon Contained less than 0.2
film through a glass spiral contain-	per cent impurity. Passed over
ing the gas. Volumes determined via	activated charcoal at liquid air
calibrated burets.	temperatures.
	2 Water Distilled
	2. water. Distilled.
	ESTIMATED ERROR:
APPARATUS/PROCEDURE:	Landar.
Used modification of Morrison and	
Billett(1) apparatus. Degassing as	
modified by Clever, et al. (2).	REFERENCES:
	1. Morrison, T. J.; Billett, F.
	J. Chem. Soc. 1948, 2033;
	ibid 1952 3819
1	<u></u>
	2. Clever, H. L.; Battino, R.;
	<ol> <li>Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.</li> </ol>

$\frac{1}{10000000000000000000000000000000000$		
1 Noon • No • $7/4/0=01=9$	URIGINAL MEASU	JREMENTS:
1. Neon, Ne, 7440-01-5	Krestov, G.	.A.; Patsatsiya, G.M.
2. Water; H <sub>2</sub> O; 7732-18-5		
	Izv. Vyssh	Ucheb. Zaved., Khim.
	Khim. Tekhi	<u>nol. 1969, 12,</u> 13 <u>33 -</u> 1337.
VADIADIEC.		
T/K: 283.15 - 313.15	PREPARED BY:	R. Battino
P/kPa: 101.325 (1 atm)	-	
EXPERIMENTAL VALUES:		
T/K Mol Fraction	Bunsen	Ostwald Coofficient
$x_1 \times 10^4$	$\alpha \times 10^2$	$L \times 10^2$
283.15 0.08779	1.092	1.132
293.15 0.08414*	1.045	1.122
303.15 0.08089	1.002 0.942	1.080
*Solubility value which was used in the	ne final smo	othing equation for the
recommended solubility values given in		ai evaluation.
The mole fraction solubility values a coefficients were calculated by the co	t 101.325 kl	Pa (l atm) and the Ostwald
		Ì
AUXILIARY	INFORMATION	
AUXILIARY	INFORMATION SOURCE AND PU	RITY OF MATERIALS:
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanolewater	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU NO informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa	RITY OF MATERIALS: ation given.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No inform ESTIMATED ERR δι	RITY OF MATERIALS: ation given. NOR: X1/X1= 0.01 (Compiler)
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No informa ESTIMATED ERR δ2	RITY OF MATERIALS: ation given. OOR: X1/X1= 0.01 (Compiler)
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No inform ESTIMATED ERR SI REFERENCES:	RITY OF MATERIALS: ation given. COR: X1/X1= 0.01 (Compiler)
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No inform ESTIMATED ERR δ2 REFERENCES: 1. Ben-Nai	RITY OF MATERIALS: ation given. COR: X1/X1= 0.01 (Compiler)
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No inform ESTIMATED ERR δ2 REFERENCES: 1. Ben-Nai Faraday	RITY OF MATERIALS: ation given. OOR: $X_1/X_1 = 0.01$ (Compiler) .m, A.; Baer, S. <u>Trans.</u> <u>y Soc</u> . 1963, <u>59</u> , 2735.
AUXILIARY METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.	INFORMATION SOURCE AND PU No inform ESTIMATED ERR SI REFERENCES: 1. Ben-Nai Faraday	RITY OF MATERIALS: ation given. COR: $X_1/X_1= 0.01$ (Compiler) $X_1/X_1= 0.01$ (Compiler) $X_2$ , A.; Baer, S. <u>Trans</u> . $X_2$ Soc. 1963, <u>59</u> , 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9	Weiss, R. F.
2. Water; H <sub>2</sub> O; 7732-18-5	
	<u>J</u> . <u>Chem</u> . <u>Eng</u> . <u>Data</u> 1971, <u>16</u> , 235-241.
VARIABLES:	PREPARED BY:
T/K: 273.80 - 313.29 P/kPa: 101.325 (1 atm)	R. Battino
EXPERIMENTAL VALUES:	
T/K Mol Fraction Bunsen	T/K Mol Fraction Bunsen
$- \underbrace{ \begin{array}{c} X_1 \times 10^4 \\ - \end{array} \begin{array}{c} \text{Coefficient} \\ \alpha \times 10^2 \\ - \end{array} \end{array}}_{\text{Coefficient}}$	$  \underline{x_1 \times 10^4}   \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}     \underline{x_1 \times 10^2}    \underline{x_1 \times 10^2}          \underline{x_1 \times 10^2}                                    $
273.80 0.09922 1.2343 273.80 0.09935 1.2359	293.31 0.08395" 1.0426 293.32 0.08355* 1.0376
273.80 0.09892 1.2306	303.43 0.07908 0.9796
273.80 0.09974 1.2408 273.79 0.09877 1.2287	303.45 0.07973° 0.9876 303.47 0.07913* 0.9802
283.39 0.08993 1.1186	303.46 0.07869 0.9747
283.43 0.09041 <sup>°</sup> 1.1245	303.46 0.07924° 0.9815 303.46 0.07890* 0.9773
283.39 0.09028 1.1229	303.45 0.07955* 0.9853
283.39 0.09013 <sup>*</sup> 1.1210	313.27 0.07759* 0.9578 313.29 0.07712* 0.9520
293.31 0.08389 1.0419	313.29 0.07766 <sup>*</sup> 0.9587
293.30 0.08387* 1.0416	313.27 0.07710 <sup>*</sup> 0.9517
The mole fraction solubility is at 10 the neon. The mole fraction solubility *Solubility values which were used in recommended solubility values given in AUXILIARY METHOD: The Scholander micro-gasometric technique as adapted by Douglas (1) was used. The gas is dissolved in previously degassed water over mercury. All volumes are read on a micrometer which displaces mercury	<ul> <li>I.325 kPa (1 atm) partial pressure of ry was calculated by the compiler.</li> <li>the final smoothing equation for the n the critical evaluation.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>Neon. Air Reduction. Better than 99.99 per cent neon.</li> <li>Water. Distilled.</li> </ul>
micrometer which displaces mercury.	FETTMATED EDDOD.
APPARATUS/PROCEDURE:	ESTIMATED ERNON.
	δT/K = 0.01
	REFERENCES :
	<pre>1. Douglas, E. J. Phys. Chem. 1964, <u>68</u>, 169; <u>ibid</u>. 1965, <u>69</u>, 2608.</pre>

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COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9	Borina, A. F.; Lyashchenko, A. K.
2 Water: $H_0$ : 7732-18-5	
2. Mater, 120, 7752 10 5	
	<u>Zn. Fiz. Knim.</u> 1972, <u>46</u> , 249 - 250. Russ. J. Phys. Chem. (Engl. Trans)
	$1972, \frac{46}{150}, 150.$
VARIABLES:	PREPARED BY:
T/K: 293.15 P/kPa: 101.325 (1 atm)	R. Battino
EXPERIMENTAL VALUES:	
T/K Mol Fracti	on Ostwald Coefficient
x <sub>1</sub> x 10 <sup>4</sup>	$L \times 10^2$
293.15 0.08335	1.111
The neon solubility in water was a Henry's law.	djusted to 101.325 kPa (1 atm) by
	,
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS;
	1 Neon Less than 0 1 per cent
	impurities.
	2. Water. Double distilled.
APPARATUS/PROCEDURE :	ESTIMATED ERROR:
Used method of Ben-Naim and Baer (1).	
Procedure described in ref. 2. Paper	
from potassium and ammonium chloride	REFERENCES :
aqueous solutions.	1. Ben-Naim, A.; Baer, S.
	<u>Trans. Faraday Soc</u> . 1963, <u>59</u> , 2735
	2. Borina, A. F.; Lyashchenko, A. K.
	<u>21, F12, Knim</u> , 1971, <u>45</u> , 1316.

COMPONENTS	OD LCINAL AR A CUDENTING
1  Neon: Ne: 7440-01-9	Borina, A. F.; Samoilov, O. Ya.
2. water; h <sub>2</sub> 0; //32-16-5	
	<u>Zh. Strukt</u> . <u>Khim</u> . 1974, <u>15</u> , 395-402. <u>J. Struct</u> . <u>Chem</u> . 1974, <u>15</u> , 336-342.
VARIABLES:	PREPARED BY:
T/K: 288.15 - 298.15 Total P/kPa: 98.659 (740 mmHg)	R. Battino
EXPERIMENTAL VALUES:	I
	$\begin{array}{ccc} \text{Mol Fraction} & \text{Ostwald} \\ \text{X}_1 \times 10^4 & \text{Coefficient} \\ \text{at 1 atm} & \underline{\text{L} \times 10^2} \\ \hline 0.08656^* & 1.135 \end{array}$
293.15 10.98 298.15 10.58	0.08345* 1.112 0.08041 1.089
*Solubility values which were used in recommended solubility values given in The mole fraction solubility at 101.	the final smoothing equation for the n the critical evaluation. 325 kPa (1 atm) and the Ostwald
The mole fraction solubility values inverse of Henry's constant from the coefficients by the author. The inve- at 1 mmHg is K/mmHg = P/X <sub>1</sub> .	at 1 mmHg were calculated as the experimentally measured Ostwald rse of the mole fraction solubility
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The appa- ratus is designed to measure the difference in volume of the gas before dissolution and after dissolution is	<ol> <li>Neon. "Specially pure" grade. Contained less than 0.1 per cent of other gases.</li> <li>Water. Distilled.</li> </ol>
complete, with the gas and solvent in contact at constant pressure. The total pressure of neon + water vapor at its saturation value was always 740 mmHg during the measurement. The author assumed that the gas	
behaved ideally and that Henry's law is obeyed to convert the experi-	ESTIMATED ERROR:
mentally measured Ostwald coefficient to the inverse of Henry's constant.	$\delta X_1 / X_1 = 0.005$ (author)
	REFERENCES :
	<ol> <li>Lyashchenko, A.K.; Borina, A.F. <u>Zh. Strukt. Khim.</u> 1971, <u>12</u>, 964.</li> <li>Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim.</u> 1971, <u>45</u>, 1316.</li> <li>Ben-Naim, A.; Baer, S. <u>Trans. Faraday Soc.</u> 1963, <u>59</u>, 2735</li> </ol>
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COMPONENTS :	ORIGINAL MEASUREMENTS .
l. Neon: Ne: 7440-01-9	Benson, B. B.: Krause, D.
	,,
2. water; H <sub>2</sub> O; //32-18-5	
	J. Chem. Phys. 1976, 64, 689.
VARIABLES:	PREPARED BY:
T/K: 274.155 - 323.148 P/kPa: 101.325 (1 atm)	R. Battino
EXPERIMENTAL VALUES:	Pungon
X <sub>1</sub> >	$\begin{array}{c} \text{Coefficient} \\ \text{Coefficient} \\ \text{Coefficient} \\ 10^4 \qquad \alpha \times 10^2 \end{array}$
274.155 0.1	.0088 1.2560
278.151 0.0	995785° 1.1926 994733° 1.1795
283.149 0.0	991149 <sup>*</sup> 1.1347
288.149 0.0	087550 <sup>*</sup> 1.0892
293.148 0.0	084488 <sup>*</sup> 1.0502
295.152 0.0	082406 1.0231
298.158 0.0	082427 1.0233
308.142 0.0	0.9751 0.9751
313.150 0.0	078260 0.9669
323.148 0.0	0.9497
neon was calculated by the compiler. *Solubility values which were used in recommended solubility values given in	the final smoothing equation for the the critical evaluation.
AUXILIARY	INFORMATION
METHOD: Gas-free water and the pure gas	SOURCE AND PURITY OF MATERIALS:
are equilibrated, and volumetric samp- les of the liquid and gaseous phases	1. Neon. No information given.
are isolated. The gas dissolved in the	2 Water No information given
moles determined on a special mercury	z. water. No information given.
manometer. After removal of water vap-	
gaseous phase sample is measured with	
the same manometer. The pressure (and fugacity) above the solution may be	
calculated from the neon analysis.	
Real gas corrections are made. Predic- ted maximum error is 0.02 per cent.	
APPARATUS/PROCEDURE:	ESTIMATED ERROR: Smoothed data fit to
No drawings of the apparatus are given in the original paper.	Calculated error from measurements is 0.02 per cent.
	REFERENCES :

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COMPONENTS:	ORTGINAL MEASUREMENTS:
	Borina A F
1. Neon; Ne; 7440-01-9	
2. Water; H <sub>2</sub> O; 7732-18-5	
-	<u>Zh. Fiz</u> . <u>Khim</u> . 1977, <u>51</u> ,138 - 142
	<u>Russ. J. Phys. Chem. 1977, 51,76 - 78</u>
VARIABLES:	PREPARED BY:
Total P/kPa: 98.659 (740 mmHg)	R. Battino
EXPERIMENTAL VALUES:	
T/K Mol Fraction X <sub>1</sub> x 10 <sup>9</sup> at 1 mmHg	$\begin{array}{ccc} \text{Mol Fraction} & \text{Ostwald} \\ \text{X}_1 \times 10^4 & \text{Coefficient} \\ \text{at 1 atm} & \text{L } \times 10^2 \end{array}$
288.15 11.39	0.08656* 1.135
293.15 10.98 298.15 10.58	0.08345 1.112 0.08041, 1.089
303.15 10.54	0.08010 1.101
*Solubility values which were used ir recommended solubility values given ir	h the final smoothing equation for the h the critical evaluation.
The mole fraction solubility at 101. coefficients were calculated by the co	325 kPa (1 atm) and the Ostwald ompiler.
The mole fraction solubility values inverse of Henry's constant from the e coefficients by the author. The invers at 1 mmHg is K/mmHg = P/X <sub>1</sub> .	at 1 mmHg were calculated as the experimentally measured Ostwald se of the mole fraction solubility
AUXILIARY	INFORMATION
METHODYAPPARATUS PROCEDURE: The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The appa- ratus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of neon + water vapor at its saturation value was always 740 mmHg during the measurement. The author assumed that the gas behaved ideally and that the pressure	SOURCE AND PURITY OF MATERIALS: 1. Neon. "Specially pure" grade. Contained less than 0.1 per cent of other gases. 2. Water. Distilled.
law is obeyed to convert the experi-	ESTIMATED ERROR:
mentally measured Ostwald coefficient to the inverse of Henry's constant.	$\delta X_1 / X_1 = 0.005$ (author)
	<pre>REFERENCES: 1. Lyashchenko, A.K.; Borina, A.F.     Zh. Strukt. Khim. 1971, 12, 964. 2. Borina, A.F.; Lyashchenko, A.K.     Zh. Fiz. Khim. 1971, 45, 1316. 3. Ben-Naim, A.; Baer, S.     Trans. Faraday Soc. 1963, 59, 2735</pre>

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COMPONENTS:	ORIGINAL MEASUREMENTS: Borina, A. F.
1. Neon; Ne; 7440-01-9	
2. water; H <sub>2</sub> O; //32-18-5	
	<u>Zh</u> . <u>Fiz</u> . <u>Khim</u> . 1977, <u>51</u> , 406 - 409.
	<u>Russ. J. Phys. Chem</u> . 1977, <u>51</u> ,235-23
VARIABLES:	PREPARED BY:
T/K: 293.15 - 309.15 Total P/kPa: 98.659 (740 mmHg)	R. Battino
EXPERIMENTAL VALUES:	
T/K Mol Fraction Mol H $X_1 \times 10^9$ $X_1$ at 1 mmHg at	Fraction Ostwald Number of x 10 <sup>4</sup> Coefficient Determinations L atm L x 10 <sup>2</sup>
293.15 11.07 0.0	08413 <sup>*</sup> 1.121 5
305.15 10.40 0.0	07904* 1.093 4
<u> </u>	<u>07866" 1.101 5</u>
*Solubility values which were used in recommended solubility values given :	n the final smoothing equation for the in the critical evaluation.
The mole fraction solubility at 101 coefficients were calculated by the c	.325 kPa (l atm) and the Ostwald compiler.
The mole fraction solubility values inverse of Henry's constant from the coefficients by the author. The inve at 1 mmHg is K/mmHg = P/X <sub>1</sub> .	at 1 mmHg were calculated as the experimentally measured Ostwald erse of the mole fraction solubility
AUXILIARY	INFORMATION
METHOD:	SOURCE AND PURITY OF MATERIALS:
papers (1,2), was based on the design of Ben-Naim and Baer (3). The appa- ratus is designed to measure the difference in volume of the gas before	<ol> <li>Neon. "Specially pure" grade. Contained less than 0.1 per cent of other gases.</li> </ol>
dissolution and after dissolution is complete,with the gas and solvent in contact at constant pressure. The total pressure of neon + water vapor at its saturation value was always 740 mmHg during the measurement. The author assumed that the gas	2. Water. Double distilled.
law is obeyed to convert the experi-	ESTIMATED ERROR:
mentally measured Ostwald coeffici- ent to the inverse of Henry's con- stant.	$\delta X_{1} / X_{1} = 0.005$ (author)
	REFERENCES: <ol> <li>Lyashchenko, A.K.; Borina, A.F.</li> <li><u>Zh. Strukt. Khim.</u> 1971, <u>12</u>, 964.</li> <li>Borina. A.F.; Lyashchenko, A.K.</li> <li><u>Zh. Fiz. Khim.</u> 1971, <u>45</u>, 1316.</li> <li><u>Ben-Naim. A.;</u> Baer, S.</li> <li><u>Trans. Faraday Soc</u>. 1963, <u>59</u>, 2735.</li> </ol>

COMPONENTS :	
	ORIGINAL MEAS REMENTS:
1. Neon; Ne; 7440-01-9	Abrosimov, V.K.; Strakhov, A.N.;
2. Water-day D. G. 2700 co. c	Krestov, G.A.
2. $(a_2; D_2; 7/89-20-0)$	
	Izy, Vyssh, Ucheb, Zaved, Khim,
	Khim. Tekhnol.1974, 17, 1463-1465.
VARIABLES:	PREPARED BY:
T/K: 283.38 - 318.45	R. Battino
P/kPa: 101.325 (1 atm)	
EXPERIMENTAL VALUES:	
T/K Mol Frac	ction Bunsen
	Coefficient
X, x 1	$10^4$ $\alpha \times 10^2$
283.38 0.109	1.352
292.72 0.099	20 1.227
298.15 0.094	166 1.170
308.25 0.08	
318.45 0.08	/35 1.0/3
Mole fraction solubility at 101.325 kP	a (1 atm) partial pressure of gas
calculated by compiler.	
<u> </u>	
AUXILIARY	INFORMATION
METHOD.	COUDER AND DUDIER OF MARDIAL C.
The authors also measured the	SOURCE AND PURITY OF MATERIALS:
lealyhility of near in nywe yetew	No information given
solubility of neon in pure water	No information given.
solubility of neon in pure water and mixtures of $H_2O$ and $D_2O$ .	No information given.
solubility of neon in pure water and mixtures of $H_2O$ and $D_2O$ .	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
solubility of neon in pure water and mixtures of H <sub>2</sub> O and D <sub>2</sub> O.	No information given.
APPARATUS/PROCEDURE:	No information given.
APPARATUS/PROCEDURE: The apparatus (1) is a modification	Source and Portifi of MALERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler)
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and	Source and Portifi of MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler)
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	Source and Portifi of MALERIALS: No information given. ESTIMATED ERROR: $\delta X_1 / X_1 = 0.01$ (compiler)
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	Source and Portifi of MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1 / X_1 = 0.01$ (compiler) REFERENCES:
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	Source and Portifi of MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler) REFERENCES: 1. Patsatsiya, K.M.; Krestov, G.A.
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	Source and Portifi of MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler) REFERENCES: 1. Patsatsiya, K.M.; Krestov, G.A. <u>Zh. Fiz. Khim</u> . 1970, <u>44</u> , 1835.
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	SOURCE AND PORTH OF MALERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler) REFERENCES: 1. Patsatsiya, K.M.; Krestov, G.A. <u>Zh. Fiz. Khim.</u> 1970, <u>44</u> , 1835. 2. Ben-Naim A : Baer S
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	SOURCE AND PORTH OF MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler) REFERENCES: 1. Patsatsiya, K.M.; Krestov, G.A. <u>Zh. Fiz. Khim.</u> 1970, <u>44</u> , 1835. 2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	SOURCE AND PORTH OF MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler) REFERENCES: 1. Patsatsiya, K.M.; Krestov, G.A. <u>Zh. Fiz. Khim. 1970, 44</u> , 1835. 2. Ben-Naim, A.; Baer, S. <u>Trans. Faraday Soc</u> . 1963, <u>59</u> , 2735.
APPARATUS/PROCEDURE: The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).	SOURCE AND PORTH OF MATERIALS: No information given. ESTIMATED ERROR: $\delta X_1/X_1 = 0.01$ (compiler) REFERENCES: 1. Patsatsiya, K.M.; Krestov, G.A. <u>Zh. Fiz. Khim</u> . 1970, <u>44</u> , 1835. 2. Ben-Naim, A.; Baer, S. <u>Trans. Faraday Soc</u> . 1963, <u>59</u> , 2735.

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COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Sea Water	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA February 1978

CRITICAL EVALUATION:

There are two reports of the solubility of neon in sea water (1,2). König (1) reports neon solubility values at six temperatures between 273.15 and 298.15 K which he estimates to have an uncertainty of three percent. Weiss (2) reports four to five neon solubility values at each of six temperatures which he estimates to have an accuracy of ± 0.5% and a relative precision of ± 0.3%. The data of König fall consistently about 4 percent below the values of Weiss.

Presented here are the neon Bunsen solubility values of Weiss in water, sea water, and one dilution of sea water. Weiss has fitted his data by the method of least squares to an equation for the natural logarithm of the Bunsen coefficient,  $\alpha$ , which is consistent with both the integrated form of the vant Hoff equation and the Setschenow salt effect equation. The equation, which is valid for the temperature range of 273.15 to 323.15 K and salinity range of 0 to 40 S%, reproduced Weiss' neon Bunsen values with a root-mean-square deviation of 4 x  $10^{-5}$ . The equation is

 $\ln \alpha = -39.1971 + 51.8031(100/T) + 15.7699 \ln (T/100)$ 

+ S%  $[-0.124695 + 0.078374(T/100) - 0.0127972(T/100)^2]$ 

Weiss gives equations for the solubility of neon from moist air at one atm total pressure in units of ml Ne (STP)  $\rm dm^{-3}$  sea water and ml Ne (STP)  $\rm kg^{-1}$ sea water assuming that neon behaves as an ideal gas and has a mol fraction of 1.818 x  $10^{-5}$  (3) in dry air. The equations are

 $\ln[m] \operatorname{Ne}(STP) dm^{-3}] = -160.2630 + 211.0969(100/T) + 132.1657 \ln(T/100)$ 

- 21.3165(T/100) + S% [-0.122883 + 0.077055(T/100) - 0.0125568(T/100)<sup>2</sup>]

and

 $\ln[m1 \text{ Ne}(\text{STP}) \text{ kg}^{-1}] = -170.6018 + 225.1946(100/T) + 140,8863 \ln(T/100)$ 

- 22.6290(T/100) + S% [-0.127113 + 0.079277(T/100) - 0.0129095(T/100)<sup>2</sup>]

where S%, is the salinity.

The Weiss paper gives extensive tables of neon Bunsen coefficients and of ml Ne(STP) kg-l as a function of temperature and salinity as calculated from the above equations.

1.

- 2.
- König, H. Z. Naturforsch. 1963, 18a, 363. Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235. Gluckauf, E. Proc. Roy. Soc. A. 1946, 185, 98; also Compendium of 3. Meteorology, Amer. Meteorological Soc., Boston, MA 1951, 3 - 11.

COMPONENTS :	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9	Weiss, R. F.
2. Sea Water	
	<u>J. Chem. Eng. Data</u> 1971, <u>16</u> , 235-241.
VARIABLES:	PREPARED BY:
T/K: 273.22 - 313.63	H. L. Clever, S. A. Johnson
Salinity: 0 - 36.425 %	
EXPERIMENTAL VALUES: Salinit	ي <u>م</u> 80
0.0 18.152	36.425
$\frac{T/K}{272.70}$ Bunsen x 10 <sup>3</sup> T/K Bunsen 3	$\frac{10^3}{27322}$ $\frac{T/K}{9926}$
278.80 12.343	273.23 9.971
273.80 12.359	273.23 10.003
273.80 12.306 278.22 10.65 273.80 12.408 278.22 10.60	2/3.23 9.957
278.23 10.55	5 276.20 9.705
283.39 11.186 278.23 10.59	7 276.20 9.697
283.39 11.229	276.21 9.699
283.39 11.196	
203.45 11.212	283.71 9.144
293.30 10.416	283.72 9.188
293.31 10.419 293.31 10.454	293.28 8.763
293.31 10.426 298.29 9.19	7 293.28 8.744
293.32 10.376 298.29 9.20	5 293.28 8.687 293.29 8.728
303.43 9.796 298.30 9.20	293.29 8.732
303.45 9.876	
303.45 9.853	303.29 8.225
303.46 9.815	303.30 8.257
303.46 9.773	303.30 8.275
<u>303.47</u> 9.802	
Continued on next page.	
AUXILIARY	INFORMATION
METHOD: Solubility determinations by the	SOURCE AND PURITY OF MATERIALS:
as used by Douglas (1), with minor	Neon. Air Reducation Co. Specified > 99.99% pure. Gas chromatographic
modifications,	checks showed ≤ 0.01% air.
	2 See Water Passed through 0 45 u
	Millipore filter and poisoned with
	l mg/l of HgCl <sub>2</sub> .
APPARATUS/PROCEDURE: An equilibrium cham-	ESTIMATED ERROR: $\delta T/K = 0.01$
ber, containing pure gas saturated	$\delta$ salinity = 0.004
with water vapor, is separated by	
containing degassed water. The appa-	DEDEDENCIA .
ratus is tipped on its side allowing	ADFENDINGED;
aegassed water to flow into the equi- librium chamber. Dissolution is	68, 169.
aided by mechanical shaking.	<u>ibid</u> . 1965, <u>69</u> , 2608.

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COMPONENTS:	ORIGINAL MEASUREMENTS:		
1. Neon; Ne; 7440-01-9	Weiss, R. F.		
2 Son Water			
2. Sea water			
	<u>J. Chem. Eng. Data</u> 1971, <u>16</u> , 235-241.		
VARIABLES:	PREPARED BY:		
T/K: 273.22 - 313.63 Ne P/kPa: 101.325 (1 atm) Salinity: 0 - 36.425 %。	H. L. Clever, S. A. Johnson		
EXPERIMENTAL VALUES:			
Salini	ty %.		
0.0 18.152	36.425		
T/K Bunsen x 10 <sup>3</sup> T/K Bunsen	$\frac{x \ 10^3}{712} = \frac{T/K}{212} = \frac{Bunsen \ x \ 10^3}{7070}$		
313.27       9.578         313.27       9.517         313.29       9.520         313.29       9.587         313.29       9.514	313.59 8.023 313.61 8.006 313.63 8.066		
AUXILIARY	INFORMATION		
METHOD:	SOURCE AND PURITY OF MATERIALS;		
See previous page.	See previous page.		
APPARATUS/PROCEDURE:	ESTIMATED ERROR:		
See previous page.	See previous page.		
	REFERENCES:		
	See previous page		
	see previous page.		

COMPONENTS:EVALUATOR:1. Neon; Ne; 7440-01-9H. L. Clever<br/>Chemistry Department2. Water; H20; 7732-18-5Emory University<br/>Atlanta, GA 30322<br/>U. S. A.3. ElectrolytesU. S. A.

CRITICAL EVALUATION:

Until recently the only neon solubility data in aqueous electrolyte solutionswere the 1954 measurements of Morrison and Johnstone (1) in aqueous LiCl, NaCl, and KI solutions. Between 1971 and 1974 Samoilov, Borina, Lyashchenko and Alekseeva (2, 3, 4, 5, 6, 7, 8) of the N. S. Kurnakov Institute of Inorganic Chemistry, Moscow, reported the solubility of neon in 30 different aqueous electrolyte solutions. They investigated the effect of temperature, pressure and electrolyte concentration on the neon solubility.

The Russian workers discuss the neon solubility data in terms of their interest in the structure of water and aqueous electrolyte solutions. They have used three different solubility units in their different papers: units of volume of gas per unit volume of solution, volume of gas per unit weight of solvent, and Henry's law constant. They have not used the Setschenow salt parameter in their calculations or discussions.

In order to be able to compare the neon solubility behavior in aqueous electrolyte solutions with the behavior of other gases in aqueous electrolyte solutions, the results were recalculated as Setschenow salt parameters on a salt molality basis. When necessary aqueous electrolyte density values were interpolated from International Critical Tables(9) density tables. The Setschenow salt effect parameter was fitted by the method of least squares to an equation linear in molality,  $k_s = a + bm$ . The use of a linear function is not intended to imply that the Setschenow parameter is linear in molality. Feillolay and Lucas (10) have presented evidence for a maximum in  $k_s$  as a function of molality. Presently available salt effect data are not of sufficient accuracy to test the Feillolay and Lucas theory at present. The linear equations are collected in Table 1.

The value of  $k_s$  in the limit m + 0 would be desirable, but the  $k_s$  values at low salt concentration are difficult to measure accurately. The linear equations do not give as consistent a set of  $k_s$  values in the limit of m + 0 as the set of values at unit molality. Thus Table 1 contains  $k_s$  values at unit molality. In addition, values of the Setschenow salt effect parameter  $k_{sx} = (1/m)\log(X^{\circ}/X)$  at unit salt molality are given in Table 1. In the equation m is the salt molality, and the  $X^{\circ}/X$  ratio is the mole fraction gas solubility ratio with respect to gas, water and all salt ions. The definition is discussed in more detail in the discussion of salt effects on helium solubility.

Lyaschchenko and Borina (5) studied the effect of pressure on the solubility of neon in aqueous HCl, Mg(NO<sub>3</sub>)<sub>2</sub>, Ca(NO<sub>3</sub>)<sub>2</sub> and Ba(NO<sub>3</sub>)<sub>2</sub> solutions. In Table 1 two values of  $k_s$  and  $k_{sx}$  are given for these solutions. The first are from the solubility values measured at atmospheric pressure and the second are from the combination of solubility values at all pressures.

The Setschenow parameters reported by Morrison and Johnstone (1) for LiCl, NaCl, and KI solutions were based on only two solubility measurements, water and one molal salt solution, and were stated to have an uncertainty of 0.01. In all three cases the more recent salt effect parameters based on the Kurnakov Institute solubility data agree with the Morrison and Johnstone data within that uncertainty.

Several generalizations about the salt effect parameter can be observed from the data in Table 1. (1) The Setschenow salt parameter decreases as temperature increases; (2) In alkali halide solutions for a given alkali metal cation the Setschenow salt parameter decreases in the order Cl<sup>-</sup> >  $Br^- > I^-$ ; (3) For a given halide ion the Setschenow salt parameter decreases in the order Li<sup>+</sup> > Na<sup>+</sup> > K<sup>+</sup> > Rb > Cs<sup>+</sup>; In alkaline earth halide solutions (4) for a given halide ion the Setschenow salt parameter decreases in the order  $Ba^{2+} > Sr^{2+} > Ca^{2+} > Mg^{2+}$ ; (5) For a given alkaline earth cation the pattern is not clear from present data, there is some evidence that the  $Br^-$  ion is more effective at salting out than either the Cl<sup>-</sup> or I<sup>-</sup> ions.

COMPONENTS:		······	EVALUATOR:		
1. Neon; Ne; 7440-01-9		H. L. Clever Chemistry Department Emory University			
2. Water; H <sub>2</sub> O; 7732-18-5					
3. Electrol	ytes		USA GA 3	0322	
			May 1978		
CRITICAL EVAL	UATION:				
TABLE 1. Su	ummary o	f Setschenow salt e:	ffect parameters for	r neon dissolv	ed
i1	n aqueou	s electrolyte solut:	ions.		
Solution	т/к	Equation Parameters	5 Setschenow Para	meter at	Ref-
+ salt		k <sub>s</sub> = a + b m	one molal electi k <sub>s</sub> =}	colyte < <sub>sX</sub> =	eren- ce
			(ľ/m) log (S <sup>O</sup> /S)	(1/m)log(X <sup>O</sup> /X)	
HC1	293.15	0.0602 - 0.0082 m 0.0719 - 0.0123 m	0.0520 0.0596	0.0586 0.0662	5
NH4C1	293.15	0.0748 - 0.0042 m	0.0706	0.0691	4
FeCl <sub>3</sub>	293.15	0.2569 - 0.0815 m	0.1754	0.189	6
MgCl <sub>2</sub>	293.15	0.1871 - 0.0056 m	0.1815	0.194	6
MgS04	293.15	0.2487 - 0.0181 m	0.2306	0.242	2
Mg (NO <sub>3</sub> ) 2	293.15	0.1531 + 0.0294  m 0.1386 + 0.0417 m	0.1825	0.185	5
	298.15	0.206 - 0.023 m	0.183	0.185	7
0-01	303.15	0.1527	0.1527	0.154	7
CaCl <sub>2</sub>	293.15	0.2073 = 0.0012  m	0.2061	0.218	6
CaBr <sub>2</sub>	293.15	0.2208 = 0.0062  m	0.22140	0.219	6
Car <sub>2</sub>	293 15	$0.2133 \pm 0.0000$ m	0 2084	0.209	5
64(10372	295125	0.2222 - 0.0088 m	0.2133	0.214	J
SrCl <sub>2</sub>	293.15	0.2265 - 0.0005 m	0.2260	0.237	6
SrBr <sub>2</sub>	293.15	0.2259 - 0.0018 m	0.2241	0.226	6
BaCl <sub>2</sub>	293.15	0.2359 + 0.0077 m	0.2436	0.251	6
BaBr <sub>2</sub>	293.15	0.2227 + 0.0558 m	0.2785	0.276	6
BaI2	293.15	0.3240 - 0.0620 m	0.2620	0.247	6
Ba (NO <sub>3</sub> ) <sub>2</sub>	293.15	0.1783 + 0.2105 m 0.1527 + 0.2590 m	0.3889 0.4116	0.376 0.399	5
LiCl	298.15 293 15	0.0725 <b>-</b> 0.0007 m	0.059 0.0718	0.074	1
	288.15	0.0858 - 0.00075 m	0.0851	0.0928	8
	293.15	0.0826 - 0.0022  m 0.0774 - 0.0009  m	0.0765	0.0842	8
LiI	288.15	0.0979 - 0.00445 m	0.0934	0.101	8
	293.15 298.15	0.1021 - 0.0099 m 0.0884 - 0.0078 m	0.0922	0.100	8
Lin03	293.15 303.15	0.0833 + 0.0055 m 0.0822 - 0.0107 m	0.0888 0.0715	0.0905 0.0718	7 7
NaCl	298.15		0.097	0.112	1
	293.15	0.1040 + 0.0003 m 0.1265 - 0.00375 m	0.1043 0.1228	0.119 0.131	3 8
	293.15	0.1118 + 0.0001 m	0.1119	0.120	8
	298.15 303.15	0.1076 - 0.0020  m 0.1036 + 0.00045  m	0.1041	0.112	8
NaBr	293.15	0.0985 + 0.0001 m	0.0986	0.114	3
NaI	293.15	0.0965 - 0.0003 m	0.0968	0.112	3
	288.15 293.15	0.1303 - 0.0053 m 0.1045 - 0.0005 m	0.1250 0.1040	0.133 0.112	8 8
	298.15	0.1014 - 0.0011 m	0.1003	0.108	8

•

COMPONENTS:			EVALUATOR:	
l. Neon; Ne	; 7440-0	1-9	H. L. Clever	
2. Water; H	1,0; 7732	-18-5	Chemistry Department Emory University	
3 Electrol	Vtos		Atlanta, GA 30322	
J. LIECTION	.y ces		USA	
			May 1978	
CRITICAL EVAL	LUATION:			
TABLE 1. S	ummary o n aqueou	f Setschenow salt e <u>s electroly</u> te solut	ffect parameters for neon dissolved ions (continued).	_
Solution	T/K	Equation Parameter	s Setschenow Paramters at Ref-	-
$Ne + H_0$		k – a + h m	One Molal Electrolyte eren	<b>1</b> -
			$\frac{\hat{(1/m)} \log (S^{O}/S)}{(1/m) \log (X^{O}/X)}$	_
NaNO3	293.15	0.1166 - 0.0043 m	0.1123 0.114 7	
	298.15	0.0929 + 0.0017 m	0.0946 0.0952 7	
KOH	203.15	$0.0773 \pm 0.0038$ m		
KON	293.15	0.1276 - 0.0073 m	0.1205 0.132 2	
	295.15		0.1205 0.152 2	
KCI	293.15 288 15	0.1276 - 0.0140  m 0.1144 - 0.0048 m		
	290.65	0.1164 - 0.0069  m	0.1095 0.117 8	
	293.15	0.1160 - 0.0074 m	0.1086 0.116 8	
	295.65	0.1041 - 0.0032  m		
KBr	290.15	$0.0853 \pm 0.0000$ m		
NDI WT	200 15	0.0055 1 0.0025 1		
K I	298.15	0.0968 - 0.0062 m	0.0906 0.106 3	
	288.15	0.1252 - 0.0078 m	0.1174 0.125 8	
	290.65	0.1112 - 0.0051 m	0.1061 0.114 8	
	293.15	0.1053 - 0.0063 m		
	295.65	0.1001 - 0.00405  m 0.0975 - 0.0029  m	0.0946 0.104 8	•
RbC1	293.15	0.1146 - 0.0097 m	0.1049 0.103 2	
CsCl	293.15	0.0791 - 0.0011 m	0.0780 0.0934 3	
CsNO-	293.15	0.1030 + 0.0046 m	0.1076 0.0961 7	
00.003	303.15	0.0691 + 0.0098 m	0.0789 0.0660 7	

Presently there are more salt effect data of consistent good quality for neon than for any other of the noble gases.

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   Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
   Borina, A.F.; Samoilov, O.Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
   Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1972, 46, 249.
   Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1973, 14, 978.
   Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. Zh. Fiz. Khim. 1973, 47, 1748.
   Lyashchenko, A.K. Dokl. Akad. Nauk. SSSR 1974, 217 (2), 380.
   Borina, A.F.; Samoilov, O.Ya. Zh. Strukt. Khim. 1974, 15, 395.
   International Critical Tables , Washburn. E. W., Editor. McGraw-

- 9. International Critical Tables , Washburn, E. W., Editor, McGraw-Hill Book Co., Inc., New York, 1928, Volume III.
- 10. Feillolay, A.; Lucas, M. J. Phys. Chem. 1972, 76, 3068.

COMPONENTS :		ORIGINAL MEASUREMENTS:		
1. Neon; Ne; 7440-01-9		Lyashchenko, A.K.; Borina, A.F.		
2. Water; H <sub>2</sub> O; 7732-18-5				
3. Hydro	chloric Acid; H	Cl; 7647-01-0		
			Zh. Strukt. Khim	. 1973, <u>14</u> ,978 - 981.
			J. Struct. Chem.	1973, <u>14</u> , 924 - 927.
VARIABLES:	т/к: 293.15		PREPARED BY:	
Total P	/kPa: 84.73 (63 98.5	5.5 mmHg) - 25 (739 mmHg)	T. D. Kitt:	redge, H. L. Clever
HC1/mol	kg <sup>-1</sup> H <sub>2</sub> O: 0 -	2.935		
EXPERIMENTA	AL VALUES:			
т/к	Hydrochloric	P/mmHg	Neon Solubility*	Setschenow
	Acid mol kg <sup>-1</sup> H <sub>a</sub> O		s/cm <sup>3</sup> dm <sup>-3</sup>	Parameter $k_{-} = (1/m) \log(S^{O}/S)$
			-,	<u></u>
293.15	0	739	11.11	-
	1.72	737	9.26	0.0460
	$\frac{1.72}{1.72}$	700.3 676 8	8.64	(0.0498)
	1.72	635.5	7.68	(0.0552)
	2.935	737	8.71	0.0360
	2.935	701.3	8.29	(0.0355)
	2.935	671.5	7.90	(0.0363)
	$k_{s} = 0.0602$	2 - 0.0082 m (f	rom the two values	s at 737 mmHg).
	At one molal	HCl, $k_{s} = 0.052$	0 and $k_{sX} = 0.058$	6.
	$k_{c} = 0.071$	9 - 0.0123 m (f	rom all data point	ts with S corrected
	5	t	o 739 mmHg).	
	At one molal	HC1, $k_{s} = 0.059$	6 and $k_{sX} = 0.0662$	2.
*The neon solubility, S, is the same		as the Ostwald co	efficient x 10 <sup>3</sup> .	
The Se	tschenow parame	ter k <sub>s</sub> and k <sub>sX</sub>	were calculated by	y the compiler.
THE HE	on solubility i	II water, 5-, 15	IIOM TELETENCES	
AUXILIARY		AUXILIARY	INFORMATION	
METHOD.		SOURCE AND PURTTY OF	ΜΑΤΕΡΙΔΙς.	
The an	paratus descril	hed in earlier	L Noon Egnosia	MATERIALS.
papers (	1.2), was based	on the design	Contained 0.1	per cent of other
of Ben-Na	aim and Baer (3	). The appa-	gases.	
ratus is	designed to mea	asure the		ai - t i 1 1 - a
dissolut	ion and after d	issolution is	2. Water. Doubly	distilled.
complete	, with the gas a	and solvent in	3. Hydrochloric a	acid. Chemically pure
contact a	at constant pres	ssure. The	grade.	
total pre	essure of gas +	water vapor		1
$15 739 \pm$	over water is	721.5 mmHq.		
The value of $k_{sX}$ was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law				
		ESTIMATED ERROR:		
		£ 5 / 5 -	0 0035 - 0 005	
The co	1. Accentration of B	ICl in the	05/5 =	0.0035 - 0.005.
solution	was determined	after the		
experimen	nt by titration	with KOH.	REFERENCES	
			I Porino A F.	Lunghahanka A K
			Zh. Fiz. Khim.	1971, 45, 1316.
			2. Borina, A.F.;	Samoilov, O.Ya.;
			Alekseeva, L.S	5.
			Zh. Fiz. Khim.	1971, <u>45</u> , 2554.
			J. Ben-Nalm, A.; Trans Faraday	Baer, 5. 7 Soc 1963 50 2725
			Trans. Farada	

COMPONENTS:	COMPONENTS:		ORIGINAL MEASUREMENTS:		
1. Neon; Ne;	1. Neon; Ne; 7440-01-9		Borina	a, A.F.; Lyashchenko, A.K.	
2. Water; H <sub>2</sub> O	; 7732-18-5				
3. Ammonium C	hloride; NH <sub>4</sub> Cl	;	Zh. Fi	<u>iz</u> . <u>Khim</u> . 1972, <u>46</u> , 249 - 250.	
12125 02 5			Russ.	J. Phys. Chem. 1972, <u>46</u> ,150-151.	
VARIABLES:			PREPARE	D BY:	
T/K: Total P/kPa: NH <sub>4</sub> Cl/mol kg	293.15 -1 $^{98.525}_{H_2O: 0}$ - 2.	mmHg) 647		T.D.Kittredge, H.L. Clever	
EXPERIMENTAL VAL	UES:				
Т/К	Ammonium	Neon Solub	ility*	Setschenow	
	Chloride mol kg-1 H <sub>2</sub> O	s/cm <sup>3</sup> dm <sup>-3</sup>	}	$Parameter = (1/m) \log (S^{O}/S)$	
				<u></u>	
293.15	0	11.11	(S <sup>O</sup> )	-	
	0.163	10.85		0.0631	
	0.339	10.41	-	0.0834	
	0.343	10.44		0.0685	
	0.652	9.98	}	0.0714	
	1.315	9.05	5	0.0677	
	1.315	9.09		0.0632	
	2.647	7.45	5	0.0656	
$k_{\rm S} = 0.0748 - 0.0042$ m		- 0.0042 π	ı		
At one molal $NH_4Cl$ , $k_s = 0.0706$		and k	<sub>SX</sub> = 0.0691.		
<sup>^</sup> The neon solubility, S, is the same a The neon solubility in water, S <sup>O</sup> , is The values of k <sub>S</sub> and k <sub>SX</sub> were calcula			as the ( from re ated by	Dstwald coefficient x 10 <sup>5</sup> . eference 1. the compiler.	
AUXILIARY			INFORMAT	TION	
METHOD:			SOURCE	AND PURITY OF MATERIALS:	
The apparat papers (1,2), of Ben-Naim a	us,described i was based on nd Baer (3). T	n earlier the design he appa-	1. Neo Con gas	on. Especially pure grade. ntained 0.1 per cent of other ses.	
difference in	volume of the	gas before	e 2. Water. Doubly distilled.		
complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vanor is		3. Ammonium chloride. Chemically pure grade.			
739 ± 1.5 mmH pressure over	g. The neon pa water is 721.	rtial 5 mmHq.			
The value of	k <sub>sX</sub> was calcul	ated by the	·		
is ideal and	ming that the that Henry's l	gas benavic aw is	ESTIMAT	ED ERROR:	
obeyed.				$\delta S/cm^3 dm^{-3} = 0.04$	
The concent	ration of NH <sub>4</sub> C	l in the			
experiment by	titration of	the Cl by	DEEDEN	1025.	
Hg(NO <sub>3</sub> ) <sub>2</sub> .		_		NULD; rina A.F., Ivashahanka A.V.	
			2. BO	. Fiz. Khim. 1971, <u>45</u> , 1316. rina, A.F.; Samoilov, O. Ya.;	
			3. $\frac{Zh}{Bei}$	. Fiz. Khim. 1971, 45, 2554. n-Naim, A.; Baer, s. ans. Faraday Soc. 1963,59,2735.	

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COMPONENTS: ORIGINAL MEASUREMENTS: Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. 1. Neon; Ne; 7440-01-9 2. Water; H<sub>2</sub>O; 7732-18-5 3. Iron Chloride; FeCl<sub>3</sub>; 7705-08-0 Zh. Fiz. Khim. 1973, 47, 1748 - 1751. Russ. J. Phys. Chem. 1973, 47, 987 - 989 VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) FeCl<sub>3</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 0.735 PREPARED BY: T.D. Kittredge, H.L. Clever **EXPERIMENTAL VALUES:**  $k_{s} = (1/m) \log (S^{0}/S)$ Ferric Chloride Neon solubility\* T/K mol kg<sup>-1</sup> H<sub>2</sub>O  $S/cm^3 dm^{-3}$ 11.11 (S<sup>o</sup>) 10.30 293.15 0.0 0.4110 0.080 0.530 8.56 0.2137 0.735 7.96 0.1970 $k_{c} = 0.2569 - 0.0815m$  (value at 0.080m omitted) At one molal FeCl<sub>3</sub>,  $k_s = 0.1754$  and  $k_{sx} = 0.189$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The neon solubility in water, S<sup>o</sup>, is from reference 1. The values of  $k_s$  and  $k_{sX}$  were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The appa-Specially pure grade. 1. Neon. Contained 0.1 per cent of other gases. ratus is designed to measure the difference in volume of the gas before 2. Water. Distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The 3. Iron Chloride. Chemically pure. total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of  $k_{sx}$  was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed. The concentration of FeCl<sub>3</sub> was ESTIMATED ERROR:  $\delta S/S = 0.005$ determined after degassing from the density of the solution. The authors point out that there is evidence the **REFERENCES**: Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim. 1971, 45</u>, 1316.
 Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. <u>Zh. Fiz. Khim. 1971, 45</u>, 2554.
 Ben-Naim, A.; Baer, B. <u>Trans. Faraday Soc</u>. 1963, <u>59</u>,2735. iron is in the form of a FeCl<sup>2+</sup> complex in the solution.

| <b>-</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                             |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                      |  |
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Borina, A.F.; Lyashchenko, A.K.;<br>Alekseeva, L.S.                                                                                                                                                                                                                                         |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                             |  |
| 3. Magnesium Chloride; MgCl <sub>2</sub> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                             |  |
| 7786-30-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Zh. Fiz. Khim. 1973, 47, 1748-1751.<br>Russ. J. Phys. Chem. 1973, 47, 987-989.                                                                                                                                                                                                              |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PREPARED BY:                                                                                                                                                                                                                                                                                |  |
| Total P/kPa: 98.525 (739 mmHg)<br>MgCl <sub>2</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.266                                                                                                                                                                                                                                                                                                                                                                                                | T.D. Kittredge, H.L. Clever                                                                                                                                                                                                                                                                 |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                             |  |
| T/K Magnesium Neon solub<br>Chloride                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ility* k <sub>s</sub> = (1/m) log (S <sup>0</sup> /S)                                                                                                                                                                                                                                       |  |
| $\frac{\text{mol kg}^{-1} \text{H}_2 \text{O}}{\text{S/cm}^3 \text{d}}$                                                                                                                                                                                                                                                                                                                                                                                                                              | m <sup>-3</sup>                                                                                                                                                                                                                                                                             |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 (S <sup>0</sup> )<br>1 0.1349<br>3 0.1790<br>9 0.1918<br>7 0.1779<br>2 0.1724                                                                                                                                                                                                             |  |
| $k_{\perp} = 0.1871 - 0.0056m$ (v                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | alue at 0.272m omitted)                                                                                                                                                                                                                                                                     |  |
| S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                       |  |
| At one molal $MgCl_2$ , $k_s =$                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $0.1815 \text{ and } k_{SX} = 0.194.$                                                                                                                                                                                                                                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                             |  |
| The neon solubility in water, S <sup>o</sup> , is<br>The values of k <sub>s</sub> and k <sub>sX</sub> were calcula                                                                                                                                                                                                                                                                                                                                                                                   | from reference 1.<br>ted by the compiler.                                                                                                                                                                                                                                                   |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | INFORMATION                                                                                                                                                                                                                                                                                 |  |
| METHOD:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                                                                             |  |
| The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>$739 \pm 1.5$ mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>k <sub>sX</sub> was calculated by the compiler | <ol> <li>Neon. Specially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> <li>Water. Distilled.</li> <li>Magnesium Chloride. Chemically<br/>pure.</li> </ol>                                                                                                                 |  |
| assuming that the gas behavior is ideal and that Henry's law is obeved.                                                                                                                                                                                                                                                                                                                                                                                                                              | ESTIMATED ERROR:                                                                                                                                                                                                                                                                            |  |
| The concentration of MgCl <sub>2</sub> was                                                                                                                                                                                                                                                                                                                                                                                                                                                           | $\delta S/S = 0.005$                                                                                                                                                                                                                                                                        |  |
| tion of $M\sigma^{2+}$ with a chelating agent                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                             |  |
| elon of ng with a choracting agoint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul> <li>REFERENCES:</li> <li>1. Borina, A.F.; Lyashchenko, A.K.<br/>Zh. Fiz. Khim. 1971, 45, 1316.</li> <li>2. Borina, A.F.; Samoilov, O. Ya.;<br/>Alekseeva, L.S.<br/>Zh. Fiz. Khim. 1971, 45, 2554.</li> <li>3. Ben-Naim, A.; Baer, B.<br/>Trans. Faraday Soc. 1963, 59,2735.</li> </ul> |  |

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                               |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Lyashchenko, A.K.; Borina, A.F.                                                                                                                                                                                                      |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                      |  |
| 3. Magnesium Sulfate; MgSO <sub>4</sub> ;<br>7487-88-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Zh. <u>Strukt</u> . <u>Khim</u> . 1971, <u>12</u> , 964-968.<br><u>J. Struct</u> . <u>Chem</u> . 1971, <u>12</u> , 889-891.                                                                                                          |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PREPARED BY:                                                                                                                                                                                                                         |  |
| Total P/kPa: 98.525 (739 mmHg)<br>MgSO <sub>4</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.347                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | T.D. Kittredge, H.L. Clever                                                                                                                                                                                                          |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                      |  |
| T/K Magnesium Neon Solu<br>Sulfate<br>mol kg <sup>1</sup> H <sub>2</sub> O S/cm <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <pre>ability* k<sub>s</sub> = (1/m) log (S<sup>O</sup>/S) dm<sup>-3</sup></pre>                                                                                                                                                      |  |
| 293.15 0 11.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | .1 (S <sup>O</sup> )                                                                                                                                                                                                                 |  |
| 0.304 9.3<br>0.492 8.4<br>0.624 7.9<br>1.016 6.4<br>1.347 5.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 39       0.240         12       0.245         12       0.236         19       0.230         15       0.224                                                                                                                           |  |
| $k_{s} = 0.2487$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | - 0.0181 m                                                                                                                                                                                                                           |  |
| At one molal MgSO <sub>4</sub> , k <sub>s</sub> =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.2306 and $k_{SX} = 0.242$ .                                                                                                                                                                                                        |  |
| The Setschenow parameters $k_s$ and $k_{sX}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | were calculated by the compiler.                                                                                                                                                                                                     |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | INFORMATION                                                                                                                                                                                                                          |  |
| METHOD:<br>The apparatus, described in an earlier<br>paper (1), was based on the design of<br>Ben-Naim and Baer (3). The apparatus<br>is designed to measure the difference<br>in volume of the gas before dissolution<br>and after dissolution is complete with<br>the gas and solvent in contact at<br>constant pressure. The total pressure<br>of gas + water vapor is 739 $\pm$ 1.5 mmH<br>The neon partial pressure is 721.5.<br>The value of $k_{SX}$ was calculated by the<br>compiler assuming that gas behavior is<br>ideal and that Henry's law is obeyed.<br>The MgSO <sub>4</sub> concentration after<br>degassing was determined by titration<br>of Mg <sup>2+</sup> by a chelating agent. | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 percent of other gases. 2. Water. Doubly distilled. 3. Magnesium sulfate. Chemically pure reagent grade. ESTIMATED ERROR:</pre>                    |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ol> <li>Borina, A.F.; Lyashchenko, A.K.<br/>Zh. Fiz. Khim. 1971, 45, 1316.</li> <li>Lyashchenko, A.K. Dokl. Akad.<br/>Nauk. SSSR 1974, 217, 380.</li> <li>Ben-Naim, A.; Baer, S. Trans.<br/>Faraday Soc. 1963, 59, 2735.</li> </ol> |  |

| 001/001/01/00                                                               |                                                       |                                            |                                                                  | · · · · · · · · · · · · · · · · · · ·                                           |  |
|-----------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------|--|
| COMPONENTS:                                                                 |                                                       |                                            | ORIGINAL MEASUREM                                                | ENTS:                                                                           |  |
| <ol> <li>Neon;</li> </ol>                                                   | Ne; 7440-01-9                                         |                                            | Lyashchenko, A.K.; Borina, A.F.                                  |                                                                                 |  |
| 2. Water;                                                                   | 2. Water; H <sub>2</sub> O; 7732-18-5                 |                                            |                                                                  |                                                                                 |  |
| 3 Magnos                                                                    | ium Nitrato. Ma                                       | (NO) .                                     |                                                                  |                                                                                 |  |
| 10377-                                                                      | 60-3                                                  | (103) 27                                   | Zh. <u>Strukt</u> . <u>Kh:</u><br>J. <u>Struct</u> . <u>Cher</u> | <u>im</u> . 1973, <u>14</u> , 978-981.<br><u>n</u> . 1973, <u>14</u> , 924-927. |  |
| VARIABLES:                                                                  | T/K: 293.15                                           | ······································     | PREPARED BY.                                                     |                                                                                 |  |
| Total P/kP                                                                  | a: 89.27 (669.                                        | 6 mmHg) -                                  |                                                                  |                                                                                 |  |
|                                                                             | 98.525                                                | (739 mmHg)                                 | T.D. Kit                                                         | ttredge, H.L. Clever                                                            |  |
| $Mg(NO_3)_2/$                                                               | mol kg <sup>-⊥</sup> H <sub>2</sub> O:                | 0 - 1.477                                  |                                                                  |                                                                                 |  |
| <u> </u>                                                                    | ۷                                                     | · · · · · · · · · · · · · · · · · · ·      |                                                                  |                                                                                 |  |
| EXPERIMENTAL                                                                | L VALUES:                                             |                                            |                                                                  |                                                                                 |  |
| т/к                                                                         | Magnesium<br>Nitrate                                  | P/mmHg N                                   | Neon Solubility*                                                 | Setschenow**<br>Parameter                                                       |  |
|                                                                             | mol kg <sup>-1</sup> H <sub>2</sub> O                 |                                            | S/cm <sup>3</sup> dm <sup>-3</sup>                               | $\frac{k_{s} = (1/m) \log (s^{o}/s)}{s}$                                        |  |
| 293.15                                                                      | 0.0                                                   | 739                                        | 11.11 (s <sup>0</sup> )                                          | -                                                                               |  |
|                                                                             | 0.186                                                 | 739                                        | 10.46                                                            | 0.1408                                                                          |  |
| 1                                                                           | 0.186                                                 | 705.8                                      | 9.99                                                             | (0.1408)                                                                        |  |
|                                                                             | 0.186                                                 | 683.5                                      | 9.69                                                             | (0.1363)                                                                        |  |
|                                                                             | 0.186                                                 | 669 6                                      | 9.50                                                             | (0, 1363)                                                                       |  |
|                                                                             | 0.325                                                 | 739                                        | 9,77                                                             | 0,1717                                                                          |  |
|                                                                             | 0.325                                                 | 727                                        | 9.62                                                             | (0.1704)                                                                        |  |
|                                                                             | 0.325                                                 | 692.5                                      | 9.35                                                             | (0.1433)                                                                        |  |
|                                                                             | 0.325                                                 | 679 5                                      | 9,18                                                             | (0.1433)                                                                        |  |
|                                                                             | 0.726                                                 | 739                                        | 8.07                                                             | 0.1912                                                                          |  |
|                                                                             | 1.477                                                 | 739                                        | 5.85                                                             | 0.1886                                                                          |  |
| ŀ                                                                           | = 0 1531 + 0 0                                        | 294 m (from t                              | be four values .                                                 | - 739 mmHg)                                                                     |  |
| At one molal $Mg(NO_3)_2$ , $k_s = 0$                                       |                                                       |                                            | 0.1825 and k <sub>sX</sub>                                       | = 0.185.                                                                        |  |
| $k_{\rm s} = 0.1386 \pm 0.0417$ m (all va                                   |                                                       |                                            | ./ m (all values)                                                |                                                                                 |  |
| At one molal $Mg(NO_3)_2$ , $k_s = 0.18$                                    |                                                       |                                            | • 0.1803 and k <sub>sX</sub>                                     | = 0.183.                                                                        |  |
| The neon                                                                    | solubility in w                                       | ater, S <sup>O</sup> , is                  | from references                                                  | l and 2.                                                                        |  |
|                                                                             |                                                       | AUXILIARY                                  | INFORMATION                                                      |                                                                                 |  |
| METHOD:                                                                     |                                                       |                                            | SOURCE AND DURTTY                                                | OF MATERIALS.                                                                   |  |
| The app<br>papers (1,<br>of Ben-Nai                                         | aratus, describ<br>2), was based o<br>m and Baer (3). | ed in earlier<br>n the design<br>The appa- | 1. Neon. Espe<br>Contained (<br>gases.                           | ecially pure grade.<br>O.l per cent of other                                    |  |
| difference                                                                  | in volume of the and after dis                        | he gas before<br>solution is               | 2. Water. Dou                                                    | ubly distilled.                                                                 |  |
| complete, with the gas and solvent in contact at constant pressure. The     |                                                       | 3. Magnesium r                             | nitrate. Chemically                                              |                                                                                 |  |
| total pressure of gas + water vapor<br>is 739 + 1.5 mmHg. The neon partial  |                                                       |                                            |                                                                  |                                                                                 |  |
| pressure over water is 721.5 mmHg.<br>The value of k, was calculated by the |                                                       |                                            |                                                                  |                                                                                 |  |
| compiler a                                                                  | ssuming that the                                      | e gas                                      | ESTIMATED ERROR:                                                 |                                                                                 |  |
| is obeyed.<br>The con                                                       | centration of M                                       | g(NO <sub>3</sub> ), in                    | δs/s                                                             | = 0.0035 - 0.005.                                                               |  |
| the soluti                                                                  | on after decase                                       | ing was                                    | 1                                                                |                                                                                 |  |
| determined                                                                  | by titration of                                       | f + he Mas                                 | REFERENCES                                                       |                                                                                 |  |
| ion with a                                                                  | cholating agen                                        | r une ng-                                  | 1. Borina A                                                      | Lyashchenko A K                                                                 |  |
| Lou with a                                                                  | cheracing agen                                        | L•                                         | Zh Fig VI                                                        | 1971 A5 1216                                                                    |  |
| *The neon                                                                   | solubility. S.                                        | is the same                                | 2. Borina. A.H                                                   | .; Samoilov, O. Ya.:                                                            |  |
| as the Os                                                                   | twald coefficie                                       | $nt \times 10^3$ .                         | Alekseeva.                                                       | L.S.                                                                            |  |
| The Sets                                                                    | chenow paramete                                       | rs k, and key                              | Zh. Fiz. Kł                                                      | <u>11m</u> . 1971, 45, 2554.                                                    |  |
| were calc                                                                   | ulated by the c                                       | ompiler.                                   | 3. Ben-Naim, A                                                   | A.; Baer, S.                                                                    |  |
| 1                                                                           |                                                       | -                                          | Trans. Fara                                                      | aday Soc. 1963, <u>59</u> ,2735.                                                |  |
| L                                                                           |                                                       |                                            |                                                                  |                                                                                 |  |

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| COMPONENTS:                                                                                                                                                                                                                               |                                                                                     |                                                  | ORIGINAL MEA                                                                                                           | ASUREMENTS:                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol> <li>Neon; Ne;</li> </ol>                                                                                                                                                                                                             | Neon; Ne; 7440-01-9                                                                 |                                                  | Lyashchenko, A.K.                                                                                                      |                                                                                                                                                 |
| 2. Water; H                                                                                                                                                                                                                               | Water; H <sub>2</sub> O; 7732-18-5                                                  |                                                  |                                                                                                                        |                                                                                                                                                 |
| 3. Magnesium Nitrate; Mg(NO <sub>3</sub> ) <sub>2</sub> ;<br>10377-60-3                                                                                                                                                                   |                                                                                     | Dokl. Akad<br>380-382; I<br>trans.) 19           | 1. <u>Nauk SSSR</u> 1974, <u>217</u> (2),<br><u>Dokl. Phys. Chem</u> . ( <u>Engl</u> .<br>974, <u>217</u> , 645 - 647. |                                                                                                                                                 |
| VARIABLES:                                                                                                                                                                                                                                |                                                                                     |                                                  | PREPARED BY:                                                                                                           |                                                                                                                                                 |
| T/K:<br>Total P/kPa:<br>MgNO <sub>3</sub> /mol kg <sup>-</sup>                                                                                                                                                                            | $^{293.15} - 303.15$<br>98.525 (739 mmHg<br>$^{-1}$ H <sub>2</sub> O: 0 - 1.50      | 1)                                               | T.D.                                                                                                                   | Kittredge, H.L. Clever                                                                                                                          |
| EXPERIMENTAL VA                                                                                                                                                                                                                           | LUES :                                                                              | -                                                |                                                                                                                        |                                                                                                                                                 |
| т/к                                                                                                                                                                                                                                       | Magnesium<br>Nitrate                                                                | Neon Solu                                        | ubility*                                                                                                               | Setschenow<br>Parameter<br>$h_{r} = (1/r) \log (s^{0}/s)$                                                                                       |
|                                                                                                                                                                                                                                           | mol kg H <sub>2</sub> 0                                                             | S/Cm                                             | am                                                                                                                     | $\frac{k_s = (1/m) \log (5/5)}{s}$                                                                                                              |
| 293.15                                                                                                                                                                                                                                    | 0<br>0.60<br>1.50                                                                   | 11.<br>8.<br>6.                                  | .11 (S <sup>O</sup> )<br>.52<br>.15                                                                                    | 0.192<br>0.171                                                                                                                                  |
|                                                                                                                                                                                                                                           | <sup>k</sup> s                                                                      | = 0.206                                          | - 0.023 m                                                                                                              |                                                                                                                                                 |
| 1                                                                                                                                                                                                                                         | At one molal Mg(NC                                                                  | ) <sub>3</sub> ) <sub>2</sub> , k <sub>s</sub> = | = 0.183 and                                                                                                            | 1 k <sub>sX</sub> = 0.185.                                                                                                                      |
| 303.15                                                                                                                                                                                                                                    | 0<br>0.70<br>1.45                                                                   | 10<br>8<br>6                                     | .59 (S <sup>O</sup> )<br>.28<br>.36                                                                                    | 0.1527<br>0.1527                                                                                                                                |
|                                                                                                                                                                                                                                           |                                                                                     | $k_{2} = 0.2$                                    | 1527                                                                                                                   |                                                                                                                                                 |
| At one molal Mg(NO <sub>3</sub> ) <sub>2</sub> , k <sub>s</sub> = 0.1                                                                                                                                                                     |                                                                                     |                                                  |                                                                                                                        | l k <sub>sX</sub> = 0.154.                                                                                                                      |
| *The neon solubility, S, is the same as the Ostwald coefficient x $10^3$ .<br>The Setschenow parameters $k_s$ and $k_{sX}$ were calculated by the compiler.<br>The neon solubility in water, S <sup>O</sup> , is from references 1 and 2. |                                                                                     |                                                  |                                                                                                                        | ald coefficient x 10 <sup>3</sup> .<br>lated by the compiler.<br>ences 1 and 2.                                                                 |
|                                                                                                                                                                                                                                           |                                                                                     | AUXILIARY                                        | INFORMATION                                                                                                            |                                                                                                                                                 |
| METHOD.                                                                                                                                                                                                                                   |                                                                                     |                                                  | SOURCE AND                                                                                                             | PURITY OF MATERIALS.                                                                                                                            |
| The apparatus, described in earlier<br>papers (1,2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the                                                                                   |                                                                                     | 1. Neon.<br>Contai<br>gases.                     | Especially pure grade.<br>ined 0.1 per cent of other                                                                   |                                                                                                                                                 |
| difference in<br>dissolution a                                                                                                                                                                                                            | volume of the ga                                                                    | s before                                         | 2. Water                                                                                                               | . Doubly distilled.                                                                                                                             |
| complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor<br>is $739 \pm 1.5$ mmHg. The neon partial<br>pressure over water is $721.5$ mmHg.                                      |                                                                                     | 3. Magnes<br>pure o                              | sium nitrate. Chemically<br>grade.                                                                                     |                                                                                                                                                 |
| compiler assuming that the gas                                                                                                                                                                                                            |                                                                                     | ESTIMATED E                                      | RROR: 807/2 - 0.02                                                                                                     |                                                                                                                                                 |
| behavior is ideal and that Henry's law<br>is obeyed.<br>The Mg(NO <sub>3</sub> ) <sub>2</sub> concentration in the                                                                                                                        |                                                                                     | δS,                                              | $\delta P/m Hg = 1.5$<br>/cm <sup>3</sup> dm <sup>-3</sup> = 0.04                                                      |                                                                                                                                                 |
| solution afte<br>end of the so<br>determined by<br>tion density<br>tabulations.                                                                                                                                                           | er degassing and a<br>plubility experime<br>y comparison of th<br>with standard der | at the<br>ent was<br>ae solu-<br>asity           | REFERENCES:<br>1. Borina<br>2. Borina<br>Alekse<br>2h. Fi                                                              | on/m = 0.02<br>a, A.F.; Lyashchenko, A.K.<br>iz. Khim. 1971, 45, 1316.<br>a, A.F.; Samoilov, O. Ya.;<br>eeva, L.S.<br>iz. Khim. 1971, 45, 2554. |
|                                                                                                                                                                                                                                           |                                                                                     |                                                  | <u>Trans</u>                                                                                                           | Faraday Soc. 1963, <u>59</u> ,2735.                                                                                                             |

| COMPONENTS:                                                                                                                                              | ORIGINAL MEASUREMENTS:                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; /440-01-9                                                                                                                                   | Borina, A.F.; Lyashchenko, A.K.;<br>Alekseeva, L.S.                                                     |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                    |                                                                                                         |
| 3. Calcium Chloride; CaCl <sub>2</sub> ;                                                                                                                 |                                                                                                         |
| 10043-52-4                                                                                                                                               | <u>Zh. Fiz. Khim. 1973, 47, 1748-1751.</u><br><u>Russ. J. Phys. Chem</u> . 1973, 47, 987-989.           |
| VARIABLES:                                                                                                                                               | PREPARED BY:                                                                                            |
| Total P/kPa: 98.525 (739 mmHg)<br>CaCl <sub>2</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.580                                                    | T.D. Kittredge, H.L. Clever                                                                             |
| EXPERIMENTAL VALUES:                                                                                                                                     |                                                                                                         |
| T/K Calcium Chloride Neon se                                                                                                                             | plubility* $k_c = (1/m) \log (S^0/S)$                                                                   |
| mol kg <sup>-1</sup> H <sub>2</sub> 0 S/cm                                                                                                               | n <sup>3</sup> dm <sup>-3</sup>                                                                         |
| 293.15 0.0 11                                                                                                                                            | -11 (S <sup>0</sup> ) -                                                                                 |
| 0.349 9                                                                                                                                                  | .40 0.2080<br>76 0.2075                                                                                 |
| 1.004 7                                                                                                                                                  | .02 0.1986                                                                                              |
|                                                                                                                                                          | .38 0.2122                                                                                              |
| k = 0.2077                                                                                                                                               | 0.0012m                                                                                                 |
| s - 0.2073                                                                                                                                               | - 0.00121                                                                                               |
| At one molal CaCl <sub>2</sub> , $k_s =$                                                                                                                 | 0.2061 and k <sub>sX</sub> = 0.218.                                                                     |
|                                                                                                                                                          |                                                                                                         |
| AUXILIARY                                                                                                                                                | INFORMATION                                                                                             |
| METHOD:                                                                                                                                                  | SOURCE AND PURITY OF MATERIALS:                                                                         |
| The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the | <ol> <li>Neon. Specially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> </ol>          |
| difference in volume of the gas before                                                                                                                   | 2. Water. Distilled.                                                                                    |
| dissolution and after dissolution is<br>complete, with the gas and solvent in                                                                            | 3. Calcium Chloride. Chemically                                                                         |
| contact at constant pressure. The                                                                                                                        | pure.                                                                                                   |
| 739 + 1.5 mmHg. The neon partial                                                                                                                         |                                                                                                         |
| pressure is $7\overline{2}1.5$ mmHg. The value of $k_{\rm compiler}$                                                                                     |                                                                                                         |
| assuming that the gas behavior is                                                                                                                        | ESTIMATED ERROR:                                                                                        |
| ideal and that Henry's law is obeyed.                                                                                                                    | $\delta S/S = 0.005$                                                                                    |
| determined after degassing by                                                                                                                            | 03/3 - 0.003                                                                                            |
| titration of the $Ca^{2+}$ by a chelating                                                                                                                | DEPENDENCEC.                                                                                            |
| agent.                                                                                                                                                   | 1. Borina, A.F.; Lyashchenko, A.K.                                                                      |
|                                                                                                                                                          | 2. <u>Zh. Fiz</u> . <u>Khim</u> . 1971, <u>45</u> , 1316.<br>2. <u>Borina</u> , A.F.; Samoilov, O. Ya.; |
|                                                                                                                                                          |                                                                                                         |
|                                                                                                                                                          | Alekseeva, L.S.<br><u>Zh. Fiz. Khim</u> . 1971, 45, 2554.                                               |

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COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. Water; H<sub>2</sub>O; 7732-18-5 2. Calcium Bromide; CaBr<sub>2</sub>;7789-41-5 3. <u>Zh. Fiz. Khim</u>. 1973, <u>47</u>, 1748-1751. <u>Russ</u>. J. <u>Phys</u>. <u>Chem</u>. 1973, <u>47</u>, 987-989. VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) CaBr<sub>2</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 1.831 T.D. Kittredge, H.L. Clever **EXPERIMENTAL VALUES:** Neon solubility\*  $k_{e} = (1/m) \log (S^{O}/S)$ T/K Calcium Bromide mol kg<sup>-1</sup>  $H_2O$  $S/cm^3 dm^{-3}$ 11.11 (S<sup>o</sup>) 293.15 0.0 0.161 10.21 0.2278 0.407 9.46 0.1716 8.37 0.578 0.2128 0.2086 0.935 7.09 1.161 6.33 0.2104 1.831 4.48 0.2154  $k_{c} = 0.2208 - 0.0062m$  (value at 0.407m omitted) At one molal CaBr<sub>2</sub>,  $k_s = 0.2146$  and  $k_{sX} = 0.219$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The neon solubility in water, S<sup>o</sup>, is from reference 1. The values of  $k_s$  and  $k_{sx}$  were calculated by the compiler. **...** AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: Neon. Specially pure grade. The apparatus, described in earlier 1. papers (1, 2), was based on the design of Ben-Naim and Baer (3). The appa-ratus is designed to measure the Contained 0.1 per cent of other gases. difference in volume of the gas before 2. Water. Distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is  $739 \pm 1.5$  mmHg. The neon partial pressure is 721.5 mmHg. The value of  $k_{SX}$  was calculated by the compiler 3. Calcium Bromide. Chemically pure. assuming that the gas behavior is **ESTIMATED ERROR:** ideal and that Henry's law is obeyed.  $\delta S/S = 0.005$ The concentration of CaBr, was determined after degassing by titration of the  $\mbox{Ca}^{2+}$  by a chelating **REFERENCES:** agent. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. Borina, A.F.; Samoilov, O. Ya.; 1. 2. Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554. Ben-Naim, A.; Baer, B. 3. Trans. Faraday Soc. 1963, 59,2735.

| COMPONENTS:                                                                                                                                                                                                                                     |                                                                                                              | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                       |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                          |                                                                                                              | Borina, A.F.; Lyashchenko, A.K.;<br>Alekseeva, L.S.                                                                                                                                                                          |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                           |                                                                                                              |                                                                                                                                                                                                                              |  |  |
| 3. Calcium Iod                                                                                                                                                                                                                                  | lide; CaI <sub>2</sub> ; 10102-68-8                                                                          |                                                                                                                                                                                                                              |  |  |
|                                                                                                                                                                                                                                                 |                                                                                                              | <u>Zh. Fiz. Khim</u> . 1973, <u>47</u> , 1748 - 1751.<br>Russ. J.Phys.Chem. 1973, 47,987 -989.                                                                                                                               |  |  |
| VARIABLES:<br>T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>CaI <sub>2</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.742                                                                                                               |                                                                                                              | PREPARED BY:<br>T.D.Kittredge, H.L.Clever                                                                                                                                                                                    |  |  |
| EXPERIMENTAL VALU                                                                                                                                                                                                                               | ES:                                                                                                          |                                                                                                                                                                                                                              |  |  |
| Т/К                                                                                                                                                                                                                                             | Calcium Iodide Neon So                                                                                       | $lubility^*$ $k_s = (1/m) \log (S^O/S)$                                                                                                                                                                                      |  |  |
|                                                                                                                                                                                                                                                 | mol kg <sup>-1</sup> H <sub>2</sub> O S/cm <sup>3</sup>                                                      | dm <sup>-3</sup>                                                                                                                                                                                                             |  |  |
| 293.15                                                                                                                                                                                                                                          | 0 11<br>0.162 10<br>0.566 8<br>1.187 6<br>1.742 4                                                            | .11 (S <sup>O</sup> )     -       .29     0.2055       .19     0.2340       .16     0.2158       .45     0.2281                                                                                                              |  |  |
|                                                                                                                                                                                                                                                 | $k_{5} = 0.213$                                                                                              | 5 + 0.0080 m                                                                                                                                                                                                                 |  |  |
|                                                                                                                                                                                                                                                 | At one molal CaI <sub>2</sub> , k                                                                            | $s = 0.2215$ and $k_{sX} = 0.215$                                                                                                                                                                                            |  |  |
| The values c                                                                                                                                                                                                                                    | of k <sub>s</sub> and k <sub>sX</sub> were calcul                                                            | ated by the compiler.                                                                                                                                                                                                        |  |  |
|                                                                                                                                                                                                                                                 | AUXILIARY                                                                                                    | INFORMATION                                                                                                                                                                                                                  |  |  |
| METHOD:                                                                                                                                                                                                                                         |                                                                                                              | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                              |  |  |
| The apparatus,<br>papers (1, 2),<br>of Ben-Naim an<br>ratus is desig                                                                                                                                                                            | described in earlier<br>was based on the design<br>d Baer (3). The appa-<br>ned to measure the               | <ol> <li>Neon. Specially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> </ol>                                                                                                                               |  |  |
| dissolution an                                                                                                                                                                                                                                  | d after dissolution is                                                                                       | 2. water. Distilled.                                                                                                                                                                                                         |  |  |
| complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 $\pm$ 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{sx}$ was calculated by the compiler |                                                                                                              | 3. Calcium iodide. Chemically pure.                                                                                                                                                                                          |  |  |
| assuming that<br>ideal and that<br>The Ca <sup>2+</sup> con<br>ned after dega<br>a chelating ag                                                                                                                                                 | the gas behavior is<br>Henry's law is obeyed.<br>centration was determi-<br>issing by titration with<br>ent. | ESTIMATED ERROR: $\delta S/S = 0.005$                                                                                                                                                                                        |  |  |
|                                                                                                                                                                                                                                                 |                                                                                                              | REFERENCES:                                                                                                                                                                                                                  |  |  |
|                                                                                                                                                                                                                                                 | ·                                                                                                            | <ol> <li>Borina, A.F.; Lyashchenko, A.K.<br/><u>Zh. Fiz. Khim.</u> 1971, 45, 1316.</li> <li>Borina, A.F.; Samoilov, O. Ya.;<br/>Alekseeva, L.S.<br/>Zh. Fiz. Khim. 1971, 45, 2554.</li> <li>Ben-Nalm. A.; Baer, S</li> </ol> |  |  |
|                                                                                                                                                                                                                                                 |                                                                                                              | Trans. Faraday Soc. 1963, 59,2735.                                                                                                                                                                                           |  |  |

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COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Lyashchenko, A.K.; Borina, A.F. Water; H<sub>2</sub>O; 7732-18-5 2. 3. Calcium Nitrate; Ca(NO3); <u>Zh. Strukt. Khim</u>. 1973, <u>14</u>, 978-981. <u>J. Struct</u>. <u>Chem</u>. 1973, <u>14</u>, 924-927. 10124-37-5 VARIABLES: T/K: PREPARED BY: 293.15 Total P/kPa: 89.25 (669.4 mmHg) -98.525 (739 mmHg) T.D. Kittredge, H.L. Clever  $Ca(NO_3)_2/mol kg^{-1} H_2O: 0 - 1.85$ EXPERIMENTAL VALUES: T/K Calcium P/mmHg Neon Solubility\* Setschenow Nitrate Parameter s/cm<sup>3</sup> dm<sup>-3</sup> mol kg<sup>-1</sup> H<sub>2</sub>O  $k_{s} = (1/m) \log (S^{O}/S)$ 11.11 (S<sup>O</sup>) 739 0.0 293.15 739 0.195 10.08 0.2167 669.4 0.195 9.01 (0.2456)739 0.409 9.14 0.2073 0.830 739 7.64 0.1959 739 1.85 4.82 0.1960 (0.2040) 1.85 715.9 4.51 739 1.85 4.24 0.2261  $k_{e} = 0.2082 + 0.0002 \text{ m}$  (from the five values at 739 mmHg) At one molal Ca(NO<sub>3</sub>)<sub>2</sub>,  $k_s = 0.2084$  and  $k_{sx} = 0.209$ .  $k_{c} = 0.2222 - 0.0088 \text{ m}$  (all values) At one molal Ca(NO<sub>3</sub>)<sub>2</sub>,  $k_{s} = 0.2133$  and  $k_{sx} = 0.214$ . \*The neon solubility, S, is the same as the Ostwald coefficient x 10<sup>3</sup>. The Setschenow parameters  $k_s$  and  $k_{sX}$  were calculated by the compiler. The neon solubility in water, S<sup>o</sup>, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. ers (1,2), was based on the design Contained 0.1 per cent of other papers (1,2), was based on the design of Ben-Naim and Baer (3). The appagases. ratus is designed to measure the difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Calcium nitrate. Chemically pure contact at constant pressure. The total pressure of gas + water vapor grade. is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k<sub>sx</sub> was calculated by the compiler assuming that the gas ESTIMATED ERROR: behavior is ideal and that Henry's law is obeyed.  $\delta S/S = 0.0035 - 0.005.$ The concentration of  $Ca(NO_3)_2$  in the solution after degassing was deter-mined by titration of the Ca<sup>2+</sup> ion **REFERENCES**: with a chelating agent. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. Borina, A.F.; Samoilov, O. Ya.; 1. 2. Alekseeva, L.S. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 2554. Ben-Naim, A.; Baer, S. 3. Trans. Faraday Soc. 1963, 59,2735.

| COMPONENTS:                                               |                                                                                    |                                           | ORIG              | NAL MEASUREMENTS:                                                                                                                  |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; I                                                | Ne; 7440-01-9                                                                      |                                           | Bor               | ina, A.F.; Lyashchenko, A.K.;                                                                                                      |
| 2. Water;                                                 | H <sub>2</sub> O; 7732-18-5                                                        |                                           | <u> </u>          | lekseeva, L.S.                                                                                                                     |
| 7 Stropt                                                  | 2'                                                                                 |                                           |                   |                                                                                                                                    |
| 10476-                                                    | $R_{5-4}$                                                                          | 2'                                        | 7 h               | Fiz Khim 1973 47 1748 - 1751                                                                                                       |
| 10470                                                     | 55-4                                                                               |                                           | Rus               | <u>s. J. Phys.</u> <u>Chem</u> . 1973, <u>47</u> , 987 - 989                                                                       |
| VARIABLES:                                                | / . 207 15                                                                         |                                           | PREPA             | RED BY:                                                                                                                            |
| Total P/kP<br>SrCl <sub>2</sub> /mol                      | a: 98.525 (739 mml<br>kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.4                   | Hg)<br>74                                 |                   | T.D. Kittredge, H.L. Clever                                                                                                        |
| EXPERIMENTAL                                              | VALUES:                                                                            |                                           |                   | ······································                                                                                             |
| Т/К                                                       | Strontium No                                                                       | eon solubi                                | lity              | $k_{c} = (1/m) \log (S^{O}/S)$                                                                                                     |
| •                                                         | Chloride                                                                           | 7                                         | . 7               | 5                                                                                                                                  |
|                                                           | mo1 kg <sup>-1</sup> H <sub>2</sub> O                                              | S/cm <sup>3</sup> dn                      | 1-3               |                                                                                                                                    |
| 293.15                                                    | 0.0                                                                                | 11.11                                     | (s <sup>o</sup> ) | -                                                                                                                                  |
|                                                           | 0.351                                                                              | 9.23                                      |                   | 0.2294                                                                                                                             |
|                                                           | 0.495                                                                              | 8.62                                      |                   | 0.2228                                                                                                                             |
|                                                           | 1.094                                                                              | 6.10                                      |                   | 0.2380                                                                                                                             |
|                                                           | 2.015<br>2.474                                                                     | 4.04 3.01                                 |                   | 0.2180<br>0.2292                                                                                                                   |
|                                                           | k                                                                                  | = 0 2265                                  | - 0               | 0.0.5M                                                                                                                             |
|                                                           | <sup>ĸ</sup> s                                                                     | - 0.2203                                  | - 0.              | 5003M                                                                                                                              |
|                                                           | At one molal Sr                                                                    | $c1_2, k_s =$                             | 0.22              | 50 and $k_{sX} = 0.237$ .                                                                                                          |
| -                                                         |                                                                                    |                                           |                   |                                                                                                                                    |
|                                                           |                                                                                    | AUXILIARY                                 | INFOR             | MATION                                                                                                                             |
| METHOD:                                                   |                                                                                    |                                           | SOUR              | CE AND PURITY OF MATERIALS:                                                                                                        |
| The appara<br>papers (1,<br>of Ben-Nai<br>ratus is d      | tus, described in<br>2), was based on<br>m and Baer (3). T<br>esigned to measure   | earlier<br>the design<br>he appa-<br>the  | 1.                | Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.                                                           |
| difference<br>dissolutio                                  | in volume of the<br>n and after dissolu                                            | gas before<br>ution is                    | 2.                | Water. Distilled.                                                                                                                  |
| complete,<br>contact at<br>total pres<br>739 <u>+</u> 1.5 | with the gas and s<br>constant pressure<br>sure of gas + wate<br>nmHg. The neon pa | olvent in<br>. The<br>r vapor is<br>rtial | 3.                | Strontium Chloride. Chemically pure.                                                                                               |
| pressure i<br>k <sub>ey</sub> was ca                      | s 721.5 mmHg. The<br>lculated by the co                                            | value of<br>mpiler                        |                   |                                                                                                                                    |
| assuming the con                                          | hat the gas behavion<br>that Henry's law in<br>centration of SrCl                  | or is<br>s obeyed.<br>2 was               | ESTI              | MATED ERROR:<br>$\delta S/S = 0.005$                                                                                               |
| determined<br>titration                                   | after degassing b<br>of the C1 <sup>-</sup> with Hg                                | 2<br>y<br>(NO_)                           |                   |                                                                                                                                    |
|                                                           | 0                                                                                  | (102)3.                                   |                   |                                                                                                                                    |
|                                                           |                                                                                    | (1103)2                                   | REFE              | RENCES:                                                                                                                            |
|                                                           |                                                                                    | (103)2                                    | REFE<br>1.<br>2.  | RENCES:<br>Borina, A.F.; Lyashchenko, A.K.<br>Zh. Fiz. Khim. 1971, 45, 1316.<br>Borina, A.F.; Samoilov, O. Ya.;<br>Alekseeva, L.S. |

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COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. 2. Water; H<sub>2</sub>O; 7732-18-5 Strontium Bromide; SrBr<sub>2</sub>; 3. <u>Zh. Fiz. Khim. 1973, 47, 1748 - 1751.</u> <u>Russ. J.Phys.Chem</u>. 1973, <u>47</u>, 987-989. 10476-81-0 VARIABLES: PREPARED BY: VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) SrBr<sub>2</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 1.345 T.D. Kittredge, H.L. Clever **EXPERIMENTAL VALUES:**  $k_{s} = (1/m) \log (S^{0}/S)$ T/K Strontium Neon solubility\* Bromide mol kg<sup>-1</sup> H<sub>2</sub>O  $S/cm^3 dm^{-3}$ 11.11 (S<sup>o</sup>) 293.15 0.0 0.2148 0.340 9.39 0.438 8.75 0.2368 0.635 9.41 (0.1136)1.345 5.58 0.2224  $k_{s} = 0.2259 - 0.0018m$ At one molal SrBr<sub>2</sub>,  $k_s = 0.2241$  and  $k_{sX} = 0.226$ . \*The neon solubility, S, is the same as the Ostwald coefficient x 10<sup>3</sup>. The neon solubility in water, S<sup>o</sup>, is from reference 1. The values of  $k_s$  and  $k_{sx}$  were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The appa-Neon. Specially pure grade. Contained 0.1 per cent of other 1. gases. ratus is designed to measure the difference in volume of the gas before 2. Water. Distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Strontium Bromide. Chemically contact at constant pressure. The pure. total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k<sub>sX</sub> was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed. ESTIMATED ERROR: The concentration of SrBr<sub>2</sub> was  $\delta S/S = 0.005$ determined gravimetrically as SrSO<sub>4</sub>, after degassing. REFERENCES : Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. Borina, A.F.; Samoilov, O. Ya.; 1. 2. Alekseeva, L.S. <u>Zh. Fiz. Khim. 1971, 45</u>, 2554. Ben-Naim, A.; Baer, B. 3. Trans. Faraday Soc. 1963, 59,2735.

| ·····                                                                                                                |                                                                                                                                              |                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMPONENTS:                                                                                                          |                                                                                                                                              | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                     |
| 1. Neon; N                                                                                                           | e; 7440-01-9                                                                                                                                 | Alekseeva, L.S.                                                                                                                                                                                                                                                                            |
| 2. Water;                                                                                                            | H <sub>2</sub> O; 7732-18-5                                                                                                                  |                                                                                                                                                                                                                                                                                            |
| 3. Barium                                                                                                            | Chloride; BaCl <sub>2</sub> ;                                                                                                                |                                                                                                                                                                                                                                                                                            |
| 10361-37-2                                                                                                           |                                                                                                                                              | <u>Zh. Fiz. Khim</u> . 1973, 47, 1748-1751.<br><u>Russ</u> . J. Phys. <u>Chem</u> . 1973, 47, 987-989.                                                                                                                                                                                     |
| VARIABLES:                                                                                                           |                                                                                                                                              | PREPARED BY:                                                                                                                                                                                                                                                                               |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>BaCl <sub>2</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.214 |                                                                                                                                              | T.D. Kittredge, H.L. Clever                                                                                                                                                                                                                                                                |
| EXPERIMENTAL                                                                                                         | VALUES:                                                                                                                                      |                                                                                                                                                                                                                                                                                            |
| Т/К                                                                                                                  | Barium Chloride Neon sol                                                                                                                     | ubility* $k_s = (1/m) \log (S^0/S)$                                                                                                                                                                                                                                                        |
|                                                                                                                      | $\frac{\text{mol kg}^{-1} \text{H}_2 \text{O}}{\text{S/cm}^3}$                                                                               | dm <sup>-3</sup>                                                                                                                                                                                                                                                                           |
| 293.15                                                                                                               | 0.0 11.1                                                                                                                                     | 1 (S <sup>0</sup> ) -                                                                                                                                                                                                                                                                      |
|                                                                                                                      | 0.319 9.3                                                                                                                                    | 64 0.2363<br>04 0.2436                                                                                                                                                                                                                                                                     |
|                                                                                                                      | 0.866 6.8                                                                                                                                    | 5 0.2425                                                                                                                                                                                                                                                                                   |
|                                                                                                                      | 1.214 5.0                                                                                                                                    | 0.2444                                                                                                                                                                                                                                                                                     |
|                                                                                                                      | $k_{s} = 0.2359$                                                                                                                             | + 0.0077m                                                                                                                                                                                                                                                                                  |
|                                                                                                                      | At one molal BaCl <sub>2</sub> , $k_s =$                                                                                                     | 0.2436 and $k_{s\chi} = 0.251$ .                                                                                                                                                                                                                                                           |
|                                                                                                                      | 5 54                                                                                                                                         |                                                                                                                                                                                                                                                                                            |
|                                                                                                                      | AUXILIARY                                                                                                                                    | INFORMATION                                                                                                                                                                                                                                                                                |
| METHOD:                                                                                                              |                                                                                                                                              | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                                                                            |
| The apparat<br>papers (1,<br>of Ben-Naim<br>ratus is de<br>difference                                                | cus, described in earlier<br>2), was based on the design<br>and Baer (3). The appa-<br>esigned to measure the<br>in volume of the gas before | <ol> <li>Neon. Specially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> </ol>                                                                                                                                                                                             |
| dissolution                                                                                                          | and after dissolution is                                                                                                                     | 2. Water. Distilled.                                                                                                                                                                                                                                                                       |
| contact at<br>total press<br>739 <u>+</u> 1.5 m<br>pressure is<br>k <sub>sx</sub> was cal                            | constant pressure. The<br>ure of gas + water vapor is<br>mHg. The neon partial<br>721.5 mmHg. The value of<br>culated by the compiler        | 3. Barium Chloride. Chemically pure.                                                                                                                                                                                                                                                       |
| assuming th<br>ideal and t<br>The conc                                                                               | at the gas behavior is<br>hat Henry's law is obeyed.<br>entration of BaCl <sub>2</sub> was                                                   | ESTIMATED ERROR:<br>$\delta S/S = 0.005$                                                                                                                                                                                                                                                   |
| determined                                                                                                           | after degassing by titra-                                                                                                                    |                                                                                                                                                                                                                                                                                            |
|                                                                                                                      | o,                                                                                                                                           | <ul> <li>REFERENCES:</li> <li>1. Borina, A.F.; Lyashchenko, A.K.<br/>Zh. Fiz. Khim. 1971, 45, 1316.</li> <li>2. Borina, A.F.; Samoilov, O. Ya.;<br/>Alekseeva, L.S.<br/>Zh. Fiz. Khim. 1971, 45, 2554.</li> <li>3. Ben-Naim, A.; Baer, B.<br/>Trans. Faraday Soc. 1963,59,2735.</li> </ul> |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. Water; H<sub>2</sub>O; 7732-18-5 2. Barium Bromide; BaBr<sub>2</sub>; 3. <u>Zh. Fiz. Khim. 1973, 47</u>, 1748-1751. <u>Russ. J. Phys. Chem</u>. 1973, <u>47</u>, 987-989. 10553-31-8 VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) BaBr<sub>2</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 0.923 T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES: Neon solubility\*  $k_e = (1/m) \log (S^0/S)$ T/K Barium Bromide mol kg<sup>-1</sup> H<sub>2</sub>O  $S/cm^3 dm^{-3}$ 11.11 (S<sup>o</sup>) 293.15 0.0 0.189 10.09 0.2213 0.450 8.43 0.2664 0.923 6.29 0.2676  $k_s = 0.2227 + 0.0558m$ At one molal BaBr<sub>2</sub>,  $k_s = 0.2785$  and  $k_{sX} = 0.276$ . \*The neon solubility, S, is the same as the Ostwald coefficient  $x \, 10^3$ . The neon solubility in water, S<sup>0</sup>, is from reference 1. The values of  $k_s$  and  $k_{sX}$  were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: Neon. Specially pure grade. The apparatus, described in earlier 1. Contained 0.1 per cent of other papers (1, 2), was based on the design of Ben-Naim and Baer (3). The appa-ratus is designed to measure the gases. difference in volume of the gas before 2. Water. Distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of 3. Barium Chloride. Chemically pure.  $k_{sX}$  was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed. The concentration of BaBr<sub>2</sub> was **ESTIMATED ERROR:**  $\delta S/S = 0.005$ determined gravimetrically as  ${\rm BaSO}_4$  after degassing. **REFERENCES**: Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316.
 Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. <u>Zh. Fiz. Khim. 1971, 45</u>, 2554. Ben-Naim, A.; Baer, B. 3. Trans. Faraday Soc. 1963, 59,2735

| COMPONENTS:                                                                                                                         |                                                                              | ORIGINAL MEASUREMENTS:                                           |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------|--|--|
| 1. Neon; N                                                                                                                          | e; 7440-01-9                                                                 | Borina, A.F.; Lyashchenko, A.K.;                                 |  |  |
| 2. Water;                                                                                                                           | H <sub>2</sub> 0; 7732-18-5                                                  |                                                                  |  |  |
| 3. Barium                                                                                                                           | Iodide; BaI <sub>2</sub> ;13718-50-8                                         |                                                                  |  |  |
|                                                                                                                                     | 2                                                                            | <u>Zh. Fiz. Khim</u> . 1973, <u>47</u> , 1748-1751.              |  |  |
|                                                                                                                                     |                                                                              | <u>Russ.J.Phys.Chem</u> . 1973, <u>47</u> , 987-989.             |  |  |
| VARIABLES:                                                                                                                          |                                                                              | PREPARED BY:                                                     |  |  |
| Total P/kPa<br>Bal <sub>2</sub> /mol kg                                                                                             | : 98.525 (739 mmHg)<br>-1 H <sub>2</sub> O: 0 - 0.995                        | T.D. Kittredge, H.L. Clever                                      |  |  |
| EXPERIMENTAL VALUES:                                                                                                                |                                                                              |                                                                  |  |  |
| т/к                                                                                                                                 | Barium Iodide Neon sol                                                       | $lubility* k = (1/m) \log (S^0/S)$                               |  |  |
| 17 K                                                                                                                                |                                                                              | s = 3                                                            |  |  |
|                                                                                                                                     | $\frac{\text{mol kg}^{-} \text{H}_2 \text{O}}{2} \frac{\text{S/cm}^{-1}}{2}$ | dm                                                               |  |  |
| 293.15                                                                                                                              | 0.0 11.                                                                      | $-11 (S^{0})$ -                                                  |  |  |
|                                                                                                                                     | 0.240 9.                                                                     | .21 0.3394                                                       |  |  |
|                                                                                                                                     | 0.460 8.                                                                     |                                                                  |  |  |
|                                                                                                                                     | 0.333 3.                                                                     | .92 0.2740                                                       |  |  |
| $k_{\rm s} = 0.324 - 0.062m$                                                                                                        |                                                                              |                                                                  |  |  |
|                                                                                                                                     | At one molal Bal, k = 0                                                      | $0.2620$ and $k_{\rm v} = 0.247$ .                               |  |  |
|                                                                                                                                     | 2, s                                                                         | sx                                                               |  |  |
| <u> </u>                                                                                                                            |                                                                              | ,                                                                |  |  |
| The neon solubility in water, $S^{O}$ , is from reference 1.<br>The values of $k_{o}$ and $k_{ov}$ were calculated by the compiler. |                                                                              |                                                                  |  |  |
|                                                                                                                                     | 5 58                                                                         |                                                                  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |
|                                                                                                                                     | AUXILIARY                                                                    | INFORMATION                                                      |  |  |
| METHOD:                                                                                                                             |                                                                              | SOURCE AND PURITY OF MATERIALS:                                  |  |  |
| The apparate                                                                                                                        | us, described in earlier                                                     | 1. Neon. Specially pure grade.                                   |  |  |
| of Ben-Naim                                                                                                                         | and Baer (3). The appa-                                                      | gases.                                                           |  |  |
| ratus is de                                                                                                                         | signed to measure the                                                        |                                                                  |  |  |
| difference                                                                                                                          | in volume of the gas before<br>and after dissolution is                      | 2. water. Distilled.                                             |  |  |
| complete, w                                                                                                                         | ith the gas and solvent in                                                   | 3. Barium Iodide. Chemically pure.                               |  |  |
| contact at                                                                                                                          | constant pressure. The                                                       |                                                                  |  |  |
| 739 + 1.5  m                                                                                                                        | nHg. The neon partial                                                        | 5                                                                |  |  |
| pressure is                                                                                                                         | 721.5 mmHg. The value of                                                     |                                                                  |  |  |
| <sup>k</sup> sX was cale                                                                                                            | culated by the compiler                                                      |                                                                  |  |  |
| assuming the                                                                                                                        | at the gas behavior is                                                       | ESTIMATED ERROR:                                                 |  |  |
| ideal and the                                                                                                                       | hat Henry's law is obeyed.                                                   |                                                                  |  |  |
| determined                                                                                                                          | ravimetrically as Baso                                                       | $\delta S/S = 0.005$                                             |  |  |
| acter degas                                                                                                                         | sing                                                                         | · · · · · · · · · · · · · · · · · · ·                            |  |  |
| arter uegas                                                                                                                         | 21118.                                                                       | REFERENCES:                                                      |  |  |
|                                                                                                                                     |                                                                              | 1. Borina, A.F.; Lyashchenko, A.K.<br>7h. Fiz. Khim 1971 45 1316 |  |  |
|                                                                                                                                     |                                                                              | 2. Borina, A.F.; Samoilov, O. Ya.;                               |  |  |
|                                                                                                                                     |                                                                              | Alekseeva, L.S.                                                  |  |  |
|                                                                                                                                     |                                                                              | $\frac{2n. Fiz. Knim. 1971, 45, 2554.}{Ben-Naim. A.: Baer. R.}$  |  |  |
|                                                                                                                                     |                                                                              |                                                                  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Lyashchenko, A.K.; Borina, A.F. 2. Water; H<sub>2</sub>O; 7732-18-5 Barium Nitrate; Ba(NO<sub>3</sub>); <u>Zh. Strukt. Khim</u>. 1973, <u>14</u>, 978-981. J. Struct. <u>Chem</u>. 1973, <u>14</u>, 924-927. 10022-31-8 VARIABLES: T/K: 293.15 PREPARED BY: Total P/kPa: 91.12 (683.9 mmHg) -98.525 (739 mmHg) T.D. Kittredge, H.L. Clever  $Ba(NO_3)_2/mol kg^{-1} H_2O: 0 - 0.354$ EXPERIMENTAL VALUES: T/K Barium P/mmHg Neon Solubility\* Setschenow Nitrate Parameter s/cm<sup>3</sup> dm<sup>-3</sup> mol kg<sup>-1</sup> H<sub>2</sub>O  $k_s = (1/m) \log(S^O/S)$ 11.11 (s<sup>o</sup>) 293.15 0.0 739 0.2061 0.111 10.54 739 0.232 0.1970 10.00 739 0.232 9.85 (0.1747)719 0.232 9.61 (0.1747)701.9 0.232 683.9 (0.1747) 9.37 0.252 9.57 0.2572 739 (0.2753) 0.252 693.6 8.89 0.354 0.2530 739 9.04  $k_{c} = 0.1783 + 0.2105 \text{ m}$  (from the four values at 739 mmHg) At one molal Ba(NO<sub>3</sub>)<sub>3</sub>,  $k_s = 0.3889$  and  $k_{sX} = 0.376$ .  $k_{z} = 0.1527 + 0.2590 m$  (all values) At one molal Ba(NO<sub>3</sub>)<sub>3</sub>,  $k_s = 0.4116$  and  $k_{sX} = 0.399$ . The neon solubility in water, So, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. papers (1,2), was based on the design of Ben-Naim and Baer (3). The appa-Contained 0.1 per cent of other gases. ratus is designed to measure the difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Barium nitrate. Chemically pure contact at constant pressure. The grade. total pressure of gas + water vapor is 739  $\pm$  1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k<sub>sx</sub> was calculated by the compiler assuming that the gas ESTIMATED ERROR: behavior is ideal and that Henry's law  $\delta S/S = 0.0035 - 0.005.$ is obeyed. The concentration of the  $Ba(NO_3)_2$ in the solution after degassing was **REFERENCES:** determined gravimetrically as BaSO. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316.
 Borina, A.F.; Samoilov, O. Ya.; \*The neon solubility, S, is the same as the Ostwald coefficient  $x \ 10^3$ . The Setschenow parameters ks and ksX Alekseeva, L.S. Zh. Fiz. Khim. 1971, <u>45</u>, 2554. Ben-Naim, A.; Baer, S. were calculated by the compiler. 3. Trans. Faraday Soc. 1963, 59, 2735.

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ORIGINAL MEASUREMENTS:                                                                                                                                               |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Borina, A.F.; Samoilov, O. Ya.;<br>Alekseeva, L.S.                                                                                                                   |  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                      |  |  |  |
| 3. Lithium Chloride; LiCl; 7447-41-8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <u>Zh</u> . <u>Fiz</u> . <u>Khim</u> . 1971, <u>45</u> ,2554 - 2558.<br>Russ.J. Phys. Chem.1971,45,1445-1447.                                                        |  |  |  |
| VARIABLES: m/r 202 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PREPARED BY:                                                                                                                                                         |  |  |  |
| Total P/kPa: 98.525 (739 mmHg)<br>LiCl/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.138                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | T.D.Kittredge, H.L.Clever                                                                                                                                            |  |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                      |  |  |  |
| T/K Lithium Neon Solubility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | * Neon Solubility Setschenow                                                                                                                                         |  |  |  |
| Chloride<br>mol kg <sup>-1</sup> H <sub>2</sub> O S/cm <sup>3</sup> dm <sup>-3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $\begin{array}{r} \text{Parameter} \\ \text{S'/cm}^3 \text{ kg}^{-1} \text{ H}_2\text{O}  \text{k}_{\text{S}} \coloneqq (1/\text{m})\log(\text{S'O/S'}) \end{array}$ |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                      |  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $\begin{array}{ccc} 11.13 & (5'^{\circ}) & - \\ 10.30 & 0.0681 \end{array}$                                                                                          |  |  |  |
| 0.864 9.36                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 9.53 0.0771                                                                                                                                                          |  |  |  |
| 1.162 8.95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 9.16 0.0721                                                                                                                                                          |  |  |  |
| 1.288 8.77                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 9.00 0.0710<br>7.88 0.0699                                                                                                                                           |  |  |  |
| $k_{-1} = 0  0.0725 = 0  0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.0725 = 0.$ | ,                                                                                                                                                                    |  |  |  |
| $k_{S'} = 0.0725 - 0.0007 \text{ m}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                      |  |  |  |
| At one molal LiCl, $k_{s'} =$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.0718 and $k_{SX} = 0.0872$ .                                                                                                                                       |  |  |  |
| The values of $k_{s'}$ and $k_{sX}$ were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg $H_2^{0}$ .<br>The neon solubility in water, S <sup>0</sup> , is from reference 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                      |  |  |  |
| AUXILIAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Y INFORMATION                                                                                                                                                        |  |  |  |
| METHOD:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SOURCE AND PURITY OF MATERIALS:                                                                                                                                      |  |  |  |
| The apparatus, described in an                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1. Neon. Especially pure grade.                                                                                                                                      |  |  |  |
| earlier paper (1), was based on the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Contained U.1 per cent of other                                                                                                                                      |  |  |  |
| design of Ben-Naim and Baer (2). The                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | yubeb.                                                                                                                                                               |  |  |  |
| apparatus is designed to measure the difference in volume of the gas before                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2. Water. Doubly distilled.                                                                                                                                          |  |  |  |
| dissolution and after dissolution is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3. Lithium chloride. Chemically pure                                                                                                                                 |  |  |  |
| complete, with the gas and solvent in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | grade.                                                                                                                                                               |  |  |  |
| total pressure of gas + water vapor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | is                                                                                                                                                                   |  |  |  |
| 739 $\pm$ 1.5 mmHg. The neon partial                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                      |  |  |  |
| pressure is 721.5 mmHg. The value of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                      |  |  |  |
| assuming that the gas behavior is id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ealESTIMATED ERROR:                                                                                                                                                  |  |  |  |
| and that Henry's law is obeyed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | $\delta S / S = 0.005$                                                                                                                                               |  |  |  |
| The concentration of LiCl in the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 05/5 - 0.005                                                                                                                                                         |  |  |  |
| solution was determined after the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                      |  |  |  |
| with $Hg(NO_2)_2$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | REFERENCES:                                                                                                                                                          |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ol> <li>Borina, A.F.; Lyashchenko, A.K.</li> <li><u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316.</li> </ol>                                                            |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2. Ben-Naim, A.; Baer, S.                                                                                                                                            |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Trans. Faraday Soc. 1963, 59,2735.                                                                                                                                   |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Lyashchenko, A. K. 2. Water; H<sub>2</sub>O; 7732-18-5 3. Lithium Nitrate; LiNO<sub>3</sub>; 7790-69-4 <u>Dokl. Akad. Nauk SSSR</u> 1974, 217 (2), 380 - 382; <u>Dokl. Phys. Chem. (Engl.</u> trans.) 1974, 217, 645 - 647. VARIABLES: PREPARED BY: T/K: 293.15 - 303.15 Total P/kPa: 98.525 (739 mmHg) LiNO<sub>3</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 2.40 T. D. Kittredge, H. L. Clever EXPERIMENTAL VALUES: Neon Solubility\* T/K Lithium Setschenow Nitrate mol kg<sup>-1</sup> H<sub>2</sub>O Parameter  $S/cm^3 dm^{-3}$  $k_{s} = (1/m) \log (s^{o}/s)$ 293.15 0 11.11 (S<sup>O</sup>) 0.84 0.0842 9.44 1.21 8.53 0.0948 2.40 6.56 0.0953  $k_{s} = 0.0833 + 0.0055 m$ At one molal LiNO<sub>3</sub>,  $k_s = 0.0888$  and  $k_{sx} = 0.0905$ 10.59 (S<sup>O</sup>) 303.15 0 1.23 8.71 0.0690 1.80 8.16 0.0629  $k_s = 0.0822 - 0.0107 m$ At one molal LiNO<sub>3</sub>,  $k_s = 0.0715$  and  $k_{sX} = 0.0718$ \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The Setschenow parameters  $k_s$  and  $k_{sX}$  were calculated by the compiler. The neon solubility in water, S<sup>O</sup>, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. papers (1,2), was based on the design Contained 0.1 per cent of other of Ben-Naim and Baer (3). The appa-ratus is designed to measure the gases. difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Lithium nitrate. Chemically pure contact at constant pressure. The grade. total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of  $\mathbf{k}_{\text{SX}}$  was calculated by the compiler assuming that the gas ESTIMATED ERROR: behavior is ideal and that Henry's law  $\delta T/K = 0.02$ is obeyed.  $\delta P/mmHg = 1.5$  $\delta S/cm^3 dm^{-3} = 0.04$ The concentration of LiNO3 in the = 0.04 solution was determined after the = 0.02 δm/m experiment by comparison of the solution density with tabulated **REFERENCES:** density data. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316.
 Borina, A.F.; Samoilov, O.Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554. 3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59,2735.
| r                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| COMPONEN                                                                                                                 | ITS:                                                                                                                                                                                                                                                                                                                                                                                                       | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| 1. Neo                                                                                                                   | on; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                          | Borina, A.F.; Samoilov, O. Ya.;<br>Alekseeva, L.S.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| 2. Wa                                                                                                                    | ter; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| 3. Soc                                                                                                                   | dium Chloride; NaCl; 7647-14-5                                                                                                                                                                                                                                                                                                                                                                             | <u>Zh. Fiz. Khim. 1971, 45, 2554-2558.</u><br><u>Russ.J.Phys.Chem</u> . 1971, <u>45</u> , 1445-1447.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| VARIABLI                                                                                                                 | ES:                                                                                                                                                                                                                                                                                                                                                                                                        | PREPARED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
| Total I<br>NaCl/m                                                                                                        | T/K: 293.15<br>P/kPa: 98.525 (739 mmHg)<br>ol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.188                                                                                                                                                                                                                                                                                                                 | T.D. Kittredge, H.L. Clever                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| EXPERIM                                                                                                                  | ENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| т/к                                                                                                                      | Sodium Neon Solubility* N<br>Chloride                                                                                                                                                                                                                                                                                                                                                                      | eon Solubility Setschenow<br>Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|                                                                                                                          | $\frac{\text{mol kg}^{-1} \text{H}_2 \text{O} \text{S/cm}^3 \text{dm}^{-3}}{} = \frac{1}{2}$                                                                                                                                                                                                                                                                                                               | $\frac{1}{2} - \frac{1}{2} + \frac{1}$ |  |
| 293.15                                                                                                                   | 0.0 11.11 (S <sup>O</sup> )<br>0.248 10.44<br>0.658 9.31<br>1.065 8.55<br>1.701 7.00<br>2.188 6.38                                                                                                                                                                                                                                                                                                         | $\begin{array}{ccccc} 11.13 & (5'^{\circ}) & - \\ 10.50 & 0.0989 \\ 9.44 & 0.1075 \\ 8.72 & 0.0938 \\ 7.25 & 0.1090 \\ 6.66 & 0.1016 \end{array}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|                                                                                                                          | s' = 0.1040                                                                                                                                                                                                                                                                                                                                                                                                | + 0.0003 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|                                                                                                                          | At one molal NaCl, k <sub>s</sub> ,                                                                                                                                                                                                                                                                                                                                                                        | = 0.1043 and k <sub>SX</sub> = 0.119.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| The va<br>of k <sub>s</sub><br>The no                                                                                    | alues of k <sub>s</sub> , and k <sub>sX</sub> were calcul<br>, are based on the neon solubili<br>eon solubility in water, S <sup>O</sup> , is                                                                                                                                                                                                                                                              | ated by the compiler. The values<br>ty ratio per kg H <sub>2</sub> O.<br>from reference 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|                                                                                                                          | AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                  | INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| METHOD:                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                            | SOURCE AND PURITY OF MATERIALS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| The<br>earlied<br>design<br>apparat<br>differed<br>dissolu<br>complet<br>contact<br>total p<br>739 ±<br>pressur<br>k was | apparatus, described in an<br>r paper (1), was based on the<br>of Ben-Naim and Baer (2). The<br>tus is designed to measure the<br>ence in volume of the gas before<br>ation and after dissolution is<br>te, with the gas and solvent in<br>t at constant pressure. The<br>pressure of gas + water vapor is<br>1.5 mmHg. The neon partial<br>re is 721.5 mmHg. The value of<br>s calculated by the compiler | <ol> <li>Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> <li>Water. Doubly distilled.</li> <li>Sodium chloride. Chemically<br/>pure grade.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| SX                                                                                                                       | a that the gas behavioris ideal                                                                                                                                                                                                                                                                                                                                                                            | ESTIMATED ERROR:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| and that<br>The<br>solution<br>ment wa                                                                                   | at Henry's law is obeyed.<br>concentration of NaCl in the<br>on after the solubility experi-<br>as determined by titration of                                                                                                                                                                                                                                                                              | δS/S = 0.005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
| the Cl                                                                                                                   | with Hg(NO <sub>3</sub> ) <sub>2</sub> .                                                                                                                                                                                                                                                                                                                                                                   | REFERENCES:<br>1. Borina, A.F.; Lyashchenko, A.K.<br><u>Zh. Fiz. Khim</u> . 1971, <u>45</u> , 1316.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                            | <ol> <li>Ben-Naim, A.; Baer, S.<br/><u>Trans</u>. <u>Faraday</u> <u>Soc</u>. 1963, <u>59</u>,2735.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| L                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Water; H<sub>2</sub>O; 7732-18-5 2. 3. Sodium Bromide; NaBr; 7647-15-6 <u>Zh. Fiz. Khim. 1971, 45, 2554-2558.</u> <u>Russ.J.Phys.Chem</u>. 1971, <u>45</u>, 1445-1447. VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mm NaBr/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 2.010 98.525 (739 mmHg) T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES: T/K Sodium Neon Solubility\* Neon Solubility Setschenow Bromide Parameter  $s/cm^3 dm^{-3}$   $s'/cm^3 kg^{-1} H_2 O k_s = (1/m) \log(s'^{O}/s')$ mol  $kg^{-1} H_0$ 11.11 (s<sup>o</sup>) 11.13 (S'<sup>O</sup>) 293.15 0 0.630 9.43 9.59 0.1027 0.894 9.11 0.0973 8.89 1.253 8.13 8.41 0.0971 2.010 6.95 0.1017 6.60  $k_{g}$  = 0.0985 + 0.0001 m At one molal NaBr,  $k_{g}$  = 0.0986 and  $k_{gy}$  = 0.114. \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The values of  $k_{s'}$  and  $k_{sx}$  were calculated by the compiler. The values of k<sub>s</sub>, are based on the neon solubility ratio per kg H<sub>2</sub>O. The neon solubility in water, S<sup>O</sup>, is from reference 1. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The 1. Neon. Especially pure grade. Contained 0.1 per cent of other gases. apparatus is designed to measure the difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The 3. Sodium bromide. Chemically pure grade. total pressure of gas + water vapor is 739  $\pm$  1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k was calculated by the compiler ESTIMATED ERROR: assuming that the gas behavior is ideal and that Henry's law is obeyed. The concentration of NaBr in the  $\delta S/S = 0.005$ solution after the solubility experiment was determined gravimetrically as AgBr. **REFERENCES:** 1. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. 2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

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| COMPONEN                                | ITS:                                                 |                                                         | ORIGINAL MEASUREM                                   | ENTS:                                                                     |
|-----------------------------------------|------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                  |                                                      | Borina, A.F.; Samoilov, O. Ya.;<br>Alekseeva, L.S.      |                                                     |                                                                           |
| 2. Wa                                   | ter; H <sub>2</sub> 0; 773                           | 2-18-5                                                  |                                                     |                                                                           |
| 3. So                                   | dium Iodide; 1                                       | NaI; 7681-82-5                                          |                                                     |                                                                           |
|                                         |                                                      |                                                         | Zh. <u>Fiz. Khim</u> .<br><u>Russ</u> .J.Phys.Ch    | 1971, <u>45</u> , 2554-2558.<br><u>em</u> . 197 <u>1, 45</u> , 1445-1447. |
| VARIABLI                                | ES:                                                  | 5                                                       | PREPARED BY:                                        |                                                                           |
| Total I<br>NaI/mo                       | P/kPa: 98.52<br>l kg <sup>-1</sup> H <sub>2</sub> O: | 25 (739 mmHg)<br>0 - 2.023                              | T.D. Kit                                            | tredge, H.L. Clever                                                       |
| EXPERIME                                | ENTAL VALUES:                                        |                                                         | -                                                   |                                                                           |
| Т/К                                     | Sodium<br>Iodide                                     | Neon Solubility* N                                      | eon Solubility                                      | Setschenow<br>Parameter                                                   |
|                                         | mol kg <sup>-1</sup> H <sub>2</sub> O                | s/cm <sup>3</sup> dm <sup>-3</sup>                      | '/cm <sup>3</sup> kg <sup>-1</sup> H <sub>2</sub> O | k <sub>s</sub> = (1/m)log(S' <sup>O</sup> /S')                            |
| 293.15                                  | 0.0                                                  | 11.11 (s <sup>o</sup> )                                 | 11.13 (s' <sup>0</sup> )                            | -                                                                         |
|                                         | 0.327                                                | 10.18                                                   | 10.32                                               | 0.1004<br>0.0876                                                          |
|                                         | 1.038                                                | 8.39                                                    | 8.71                                                | 0.1026                                                                    |
|                                         | 1.549                                                | 7.51                                                    | 7.94                                                | 0.0947                                                                    |
|                                         | 2.023                                                | 6.61                                                    | /.11                                                | 0.0962                                                                    |
|                                         |                                                      | $k_{s'} = 0.0965$                                       | - 0.0003 m                                          |                                                                           |
|                                         | At one                                               | molal NaI, k <sub>s</sub> , = 0                         | .0962 and $k_{SX} =$                                | 0.112.                                                                    |
| of k <sub>s</sub><br>The no             | are based on                                         | n the neon solubili<br>y in water, S <sup>O</sup> , is  | ty ratio per kg                                     | H <sub>2</sub> O.                                                         |
|                                         |                                                      | AUXILIARY                                               | INFORMATION                                         |                                                                           |
| METHOD:                                 | _                                                    |                                                         | SOURCE AND PURITY                                   | OF MATERIALS:                                                             |
| The<br>earlie:<br>design                | apparatus, de<br>r paper (1), v<br>of Ben-Naim a     | escribed in an<br>was based on the<br>and Baer (2). The | Contained 0.1 per cent of other gases.              |                                                                           |
| differ                                  | ence in volume                                       | ed to measure the<br>e of the gas before                | 2. Water. Do                                        | ubly distilled.                                                           |
| dissol                                  | ution and afte<br>te, with the e                     | er dissolution is                                       | 3. Sodium iod                                       | ide. Chemically pure                                                      |
| contac                                  | t at constant                                        | pressure. The                                           | grade.                                              |                                                                           |
| total  <br> 739 +                       | pressure of ga                                       | as + water vapor is<br>e neon partial                   |                                                     |                                                                           |
| pressu                                  | re is 721.5 m                                        | mHg. The value of                                       |                                                     | •                                                                         |
| <sup>k</sup> sX <sup>wa</sup>           | s calculated 1                                       | by the compiler                                         |                                                     |                                                                           |
| assuming that the gas behavior is ideal |                                                      |                                                         | ESTIMATED ERROR:                                    |                                                                           |
| The                                     | concentration                                        | n of Nal in the                                         | δ                                                   | S/S = 0.005                                                               |
| ment wa                                 | as determined                                        | gravimetrically                                         |                                                     |                                                                           |
| as AgI                                  | •                                                    |                                                         | REFERENCES :                                        |                                                                           |
|                                         |                                                      |                                                         | l. Borina, A.<br><u>Zh. Fiz. K</u>                  | F.; Lyashchenko, A.K.<br>him. 1971, <u>45</u> , 1316.                     |
|                                         |                                                      |                                                         | 2. Ben-Naim,<br><u>Trans</u> . Far                  | A.; Baer, S.<br><u>aday</u> <u>Soc</u> . 1963, <u>59</u> ,2735.           |
|                                         |                                                      |                                                         |                                                     |                                                                           |

| COMPONENTS:                                                                                                                                                                                            | ORIGINAL MEASUREMENTS:                                                                                                                      |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                 | Lyashchenko, A.K.                                                                                                                           |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                  |                                                                                                                                             |  |  |
| 3. Sodium Nitrate; NaNO <sub>3</sub> ; 7631-99-4                                                                                                                                                       | Dokl. Akad. Nauk SSSR 1974, 217 (2),<br>380-382; Dokl. Phys. Chem. (Engl.trans.<br>1974, <u>217</u> , 645 - 647.                            |  |  |
| VARIABLES:                                                                                                                                                                                             | PREPARED BY:                                                                                                                                |  |  |
| Total P/kPa: 98.525 (739 mmHg)<br>NaNO <sub>3</sub> /mol kg <sup>-1</sup> $H_2^{O}$ : 0 - 3.10                                                                                                         | T.D. Kittredge, H.L. Clever                                                                                                                 |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                   |                                                                                                                                             |  |  |
| T/K Sodium Neon So<br>Nitrate                                                                                                                                                                          | Lubility* Setschenow<br>Parameter                                                                                                           |  |  |
|                                                                                                                                                                                                        | $\frac{dm}{s} = (1/m) \log (s/s)$                                                                                                           |  |  |
| 293.15 0 1:<br>0.80<br>1.25<br>1.82<br>3.10                                                                                                                                                            | 1.11 (S <sup>O</sup> )     -       0.03     0.1125       0.06     0.1115       7.02     0.1095       5.33     0.1029                        |  |  |
| k <sub>s</sub> = 0.116                                                                                                                                                                                 | 5 - 0.0043 m                                                                                                                                |  |  |
| At one molal NaNO <sub>3</sub> , k <sub>s</sub> =                                                                                                                                                      | 0.1123 and $k_{SX} = 0.1136$ .                                                                                                              |  |  |
| 298.15 0 1<br>1.05<br>3.10                                                                                                                                                                             | 0.90 (S <sup>0</sup> ) –<br>3.67 0.09467<br>5.41 0.09814                                                                                    |  |  |
| $k_s = 0.092$<br>At one molal NaNO <sub>3</sub> , $k_s$                                                                                                                                                | $\theta$ + 0.0017 m<br>= 0.0946 and k <sub>SX</sub> = 0.0952.                                                                               |  |  |
| 0.56<br>1.67<br>2.72                                                                                                                                                                                   | 0.59 (S )     0.0793       0.56     0.0793       7.50     0.0897       5.96     0.0918                                                      |  |  |
| $k_s = 0.077$<br>At one molal NaNO <sub>3</sub> , $k_s =$                                                                                                                                              | 3 + 0.0058 m<br>0.0831 and $k_{sX} = 0.0827$ .                                                                                              |  |  |
| AUXILIA                                                                                                                                                                                                | RY INFORMATION                                                                                                                              |  |  |
| METHOD:                                                                                                                                                                                                | SOURCE AND PURITY OF MATERIALS:                                                                                                             |  |  |
| The apparatus, described in earlipapers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the                                                              | <ol> <li>Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> </ol>                                             |  |  |
| dissolution and after dissolution is<br>complete, with the gas and solvent i                                                                                                                           | 2. Water. Doubly distilled.                                                                                                                 |  |  |
| contact at constant pressure. The<br>total pressure of gas + water vapor<br>is 739 $\pm$ 1.5 mmHg. The neon partial<br>pressure over water is 721.5 mmHg.<br>The value of $k_{sx}$ was calculated by t | grade.                                                                                                                                      |  |  |
| compiler assuming that the gas<br>behavior is ideal and that Henry's l<br>is obeyed.<br>The NaNO <sub>3</sub> concentration in the so                                                                  | ESTIMATED ERROR: $\delta T/K = 0.02$<br>$\delta P/mmHg = 1.5$<br>$\delta S/cm^3 dm^{-3} = 0.04$                                             |  |  |
| tion after degassing and at the end the solubility experiment was deter-                                                                                                                               | om/m = 0.02                                                                                                                                 |  |  |
| mined by comparison of the solution<br>density with standard density tabula                                                                                                                            | REFERENCES:                                                                                                                                 |  |  |
| tions.                                                                                                                                                                                                 | Zh. Fiz. Khim. 1971, 45, 1316.<br>2. Borina, A.F.; Samoilov, O. Ya.;                                                                        |  |  |
| *The neon solubility, S, is the same<br>as the Ostwald coefficient $\times 10^3$ .<br>The Setschenow parameters $k_s$ and $k_s$<br>were calculated by the compiler.                                    | Alekseeva, L.S.<br>Zh. Fiz. Khim. 1971, <u>45</u> , 2554.<br>3. Ben-Naim, A.; Baer, S.<br><u>Trans. Faraday</u> Soc. 1963, <u>59</u> ,2735. |  |  |

| COMPONENTS:                                                                                                                                                                                           | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                             |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                | Lyashchenko, A.K.; Borina, A.F.                                                                                                                                                                                                                                    |  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                 |                                                                                                                                                                                                                                                                    |  |  |  |
| <ol> <li>Potassium hydroxide; KOH;<br/>1310-58-3</li> </ol>                                                                                                                                           | <u>Zh. Strukt. Khim</u> . 1971, <u>12</u> , 964-968.<br><u>J. Struct</u> . <u>Chem</u> . 1971, <u>12</u> , 889-891.                                                                                                                                                |  |  |  |
| VARIABLES:                                                                                                                                                                                            | PREPARED BY:                                                                                                                                                                                                                                                       |  |  |  |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>KOH/mol kg <sup>-1</sup> $H_2$ O: 0 - 2.905                                                                                                          | T.D. Kittredge, H.L. Clever                                                                                                                                                                                                                                        |  |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                  |                                                                                                                                                                                                                                                                    |  |  |  |
| T/K Potassium hydroxide N                                                                                                                                                                             | Neon Solubility* $k_s = (1/m) \log (S^{O}/S)$                                                                                                                                                                                                                      |  |  |  |
| mol kg <sup>-1</sup> H <sub>2</sub> 0                                                                                                                                                                 | S/cm <sup>3</sup> dm <sup>-3</sup>                                                                                                                                                                                                                                 |  |  |  |
| 293.15<br>0.259<br>0.507<br>0.955<br>1.790<br>2.905                                                                                                                                                   | 11.11 (S <sup>O</sup> )       -         10.02       0.1732         9.01       0.1795         7.51       0.1781         5.91       0.1531         3.79       0.1608                                                                                                 |  |  |  |
| $k_{g} = 0.$                                                                                                                                                                                          | .1791 - 0.0079 m                                                                                                                                                                                                                                                   |  |  |  |
| At one molal KOH, k                                                                                                                                                                                   | $k_{s} = 0.1712$ and $k_{sX} = 0.183$ .                                                                                                                                                                                                                            |  |  |  |
|                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                    |  |  |  |
|                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                    |  |  |  |
| AUX                                                                                                                                                                                                   | ILIARY INFORMATION                                                                                                                                                                                                                                                 |  |  |  |
| METHOD:                                                                                                                                                                                               | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                                                    |  |  |  |
| The apparatus, described in an eapaper (1), was based on the designed. The apparis designed to measure the differ                                                                                     | arlier 1. Neon. Specially pure grade.<br>gn of Contained 0.1 percent of other<br>ratus gases.<br>rence                                                                                                                                                             |  |  |  |
| and after dissolution is complete                                                                                                                                                                     | with Water. Doubly distilled.                                                                                                                                                                                                                                      |  |  |  |
| the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is $739 \pm 1.5$ mmHg The neon partial pressure is $721.5$ . The value of $k_{sX}$ was calculated by the |                                                                                                                                                                                                                                                                    |  |  |  |
| ideal and that Henry's law is obe                                                                                                                                                                     | eyed. ESTIMATED ERROR:                                                                                                                                                                                                                                             |  |  |  |
| The KOH concentration after<br>degassing was determined by titra<br>with HCl.                                                                                                                         | δS/S = 0.005                                                                                                                                                                                                                                                       |  |  |  |
|                                                                                                                                                                                                       | <ul> <li>REFERENCES:</li> <li>1. Borina, A.F.; Lyashchenko, A.K.<br/>Zh. Fiz. Khim. 1971, 45, 1316.</li> <li>2. Lyashchenko, A.K. Dokl. Akad.<br/>Nauk. SSSR 1974, 217, 380.</li> <li>3. Ben-Naim, A.; Baer, S. Trans.<br/>Faraday Soc. 1963, 59, 2735.</li> </ul> |  |  |  |

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COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Borina, A.F.; Lyashchenko, A.K. Water; H<sub>2</sub>O; 7732-18-5 2. 3. Potassium Chloride; KCl; 7447-40-7 Zh. Fiz. Khim. 1972, 46, 249-250. Russ.J.Phys.Chem. 1972, 46, 150-151. VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 m KCl/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 1.892 98.525 (739 mmHg) T.D. Kittredge, H.L. Clever **EXPERIMENTAL VALUES:** т/к Potassium Neon Solubility\* Setschenow Chloride Parameter mol kg<sup>-1</sup> H<sub>2</sub>O  $\underline{k}_{\underline{S}} = (1/m) \log (S^{O}/S)$ s/cm<sup>3</sup> dm<sup>-3</sup> 11.11 (s<sup>o</sup>) 293.15 0.0 0.121 10.68 0.1417 0.225 10.44 0.1201 0.223 10.40 0.1286 0.431 9.94 0.1121 0.1176 0.437 9.87 0.915 8.82 0.1096 0.915 8.78 0.1117 1.890 7.08 0.1035 1.892 7.03 0.1050  $k_{c} = 0.1276 - 0.0140 m$ At one molal KCl,  $k_s = 0.1136$  and  $k_{sx} = 0.116$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The values of  $k_s$  and  $k_{sx}$  were calculated by the compiler. The neon solubility in water, S<sup>o</sup>, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. papers (1,2), was based on the design Contained 0.1 per cent of othe Contained 0.1 per cent of other of Ben-Naim and Baer (3). The appa-ratus is designed to measure the gases. difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 3. Potassium chloride. Chemically pure grade. 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k<sub>sx</sub> was calculated by the compiler assuming that the gas behavior ESTIMATED ERROR: is ideal and that Henry's law is  $\delta S/cm^3 dm^{-3} = 0.04$ obeyed. The concentration of KCl in the solutions after degassing was determined by titrating the Cl- ion with **REFERENCES:**  $Hg(NO_3)_2$ . 1. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. Borina, A.F.; Samoilov, O. Ya.; 2. Alekseeva, L.S. <u>Zh. Fiz. Khim. 1971, 45</u>, 2554. Ben-Naim, A.; Baer, S. 3. Trans. Faraday Soc. 1963, 59, 2735.

| COMPONENTS :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Borina, A.F.; Samoilov, O. Ya.;                                                                                                                                                                                                              |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Alekseeva, L.S.                                                                                                                                                                                                                              |
| 3. Potassium Bromide; KBr; 7758-02-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <u>Zh. Fiz. Khim. 1971, 45</u> , 2554-2558.<br><u>Russ.J.Phys.Chem</u> . 1971, <u>45</u> , 1445-1447.                                                                                                                                        |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PREPARED BY:                                                                                                                                                                                                                                 |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>KBr/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.971                                                                                                                                                                                                                                                                                                                                                                                                   | T.D. Kittredge, H.L. Clever                                                                                                                                                                                                                  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                              |
| T/K Potassium Neon Solubility*<br>Bromide                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Neon Solubility Setschenow<br>Parameter                                                                                                                                                                                                      |
| $\qquad \qquad $                                                                                                                                                                                                                                                                                                                                                                 | $s'/cm^3 kg^{-1} H_20 k_{s'} = (1/m) \log (s'^0/s')$                                                                                                                                                                                         |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 11.13 (S'°)- $10.69$ $0.0789$ $9.67$ $0.0914$ $9.18$ $0.0943$ $7.93$ $0.0868$ $7.43$ $0.0890$                                                                                                                                                |
| $k_{-1} = 0.0853$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | + 0.0025 m                                                                                                                                                                                                                                   |
| At one molal KBr, k <sub>s</sub> , =                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.0878 and $k_{SX} = 0.103$ .                                                                                                                                                                                                                |
| of k <sub>s</sub> , are based on the neon solubil<br>The neon solubility in water, S <sup>O</sup> , is                                                                                                                                                                                                                                                                                                                                                                                                  | ity ratio per kg H <sub>2</sub> O.<br>from reference 1.                                                                                                                                                                                      |
| AUXILIAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Y INFORMATION                                                                                                                                                                                                                                |
| METHOD:<br>The apparatus, described in an<br>earlier paper (1), was based on the<br>design of Ben-Naim and Baer (2). The<br>apparatus is designed to measure the<br>difference in volume of the gas befor<br>dissolution and after dissolution is<br>complete, with the gas and solvent ir<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>k <sub>sx</sub> was calculated by the compiler | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> <li>e 2. Water. Doubly distilled.</li> <li>3. Potassium bromide. Chemically<br/>pure grade.</li> </ul> |
| assuming that the gas behavior is ideal<br>and that Henry's law is obeyed.<br>The concentration of KBr in the<br>solution after the solubility experi-<br>ment was determined gravimetrically<br>as AgBr.                                                                                                                                                                                                                                                                                               | ESTIMATED ERROR:<br>$\delta S/S = 0.005$                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | REFERENCES:<br>1. Borina, A.F.; Lyashchenko, A.K.<br><u>Zh. Fiz. Khim</u> . 1971, <u>45</u> , 1316.                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2. Ben-Naim, A.; Baer, S.<br><u>Trans. Faraday Soc</u> . 1963, <u>59</u> , 2735.                                                                                                                                                             |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Water; H<sub>2</sub>O; 7732-18-5 2. 3. Potassium Iodide; KI; 7681-11-0 <u>Zh. Fiz. Khim. 1971, 45</u>, 2554-2558. <u>Russ.J.Phys.Chem</u>. 1971, <u>45</u>, 1445-1447. VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) KI/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 2.682 T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES: T/K Potassium Neon Solubility\* Neon Solubility Setschenow Iodide Parameter  $S/cm^{3} dm^{-3}$   $S'/cm^{3} kg^{-1} H_{2}O k_{s'} = (1/m) \log(S'^{O}/S')$ mol kg<sup>-1</sup> H<sub>2</sub>O 11.11 (s<sup>o</sup>) 11.13 (s'<sup>0</sup>) 293.15 0.0 0.398 10.13 0.1027 9.93 9.21 9.56 0.0865 1.081 8.52 8.96 0.0871 1.534 7.70 8.27 0.0841 2.682 5.88 6.64 0.0836  $k_{e_1} = 0.0968 - 0.0062 m$ At one molal KI,  $k_{s'} = 0.906$  and  $k_{sx} = 0.106$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The values of  $k_{s'}$  and  $k_{sX}$  were calculated by the compiler. The values of  $k_r$ , are based on the neon solubility ratio per kg  $H_2O$ . The neon solubility in water, S<sup>o</sup>, is from reference 1. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: 1. Neon. Especially pure grade. The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the Contained 0.1 per cent of other gases. difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is 3. Potassium iodide. Chemically complete, with the gas and solvent in contact at constant pressure. The pure grade. total pressure of gas + water vapor is 739  $\pm$  1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k<sub>sx</sub> was calculated by the compiler assuming that the gas behavior is ideal ESTIMATED ERROR: and that Henry's law is obeyed. The concentration of KI in the solution after the solubility experi- $\delta S/S = 0.005$ ment was determined gravimetrically as AgI. **REFERENCES:** 1. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim.</u> 1971, <u>45</u>, 1316. Ben-Naim, A.; Baer, S. <u>Trans. Faraday Soc</u>. 1963,<u>59</u>, 2735. 2.

| COMPONEN                                                                                                                                                 | ITS:                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                  | ORIGINAL MEASUREME                                                                                            | NTS:                                                                                              |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   | Borina, A.F.; Samoilov, O. Ya.;                                                                                                                                                                                                                  |                                                                                                               |                                                                                                   |  |  |  |
| 2. Wa                                                                                                                                                    | ter; H <sub>2</sub> 0; 7732                                                                                                                                                                                                                                                                                       | 2-18-5                                                                                                                                                                                                                                           |                                                                                                               |                                                                                                   |  |  |  |
| 3. Ce                                                                                                                                                    | sium Chloride;                                                                                                                                                                                                                                                                                                    | ; CsCl; 7647-17-8                                                                                                                                                                                                                                | Zh. Fiz. Khim.<br>Russ.J.Phys.Che                                                                             | 1971, <u>45</u> , 2554-2558.<br><u>m</u> . 1971, <u>45</u> , 1445-1447.                           |  |  |  |
| VARIABLE                                                                                                                                                 | 25:                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                  | PREPARED BY:                                                                                                  |                                                                                                   |  |  |  |
| Total 1<br>CsCl/m                                                                                                                                        | T/K: 293.15<br>P/kPa: 98.52<br>pl kg <sup>-1</sup> H <sub>2</sub> O:                                                                                                                                                                                                                                              | 5<br>25 (739 mmHg)<br>0 - 2.612                                                                                                                                                                                                                  | T.D. Kit                                                                                                      | tredge, H.L. Clever                                                                               |  |  |  |
| EXPERIME                                                                                                                                                 | EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                  |                                                                                                               |                                                                                                   |  |  |  |
| т/к                                                                                                                                                      | Cesium<br>Chloride                                                                                                                                                                                                                                                                                                | Neon Solubility*                                                                                                                                                                                                                                 | Neon Solubility                                                                                               | Setschenow<br>Parameter                                                                           |  |  |  |
|                                                                                                                                                          | $\frac{\text{mol kg}^{-1} H_2 0}{2}$                                                                                                                                                                                                                                                                              | $S/cm^3 dm^{-3}$                                                                                                                                                                                                                                 | S'/cm <sup>3</sup> kg <sup>-1</sup> H <sub>2</sub> O                                                          | k <sub>s'</sub> = (1/m)log(S' <sup>O</sup> /S')                                                   |  |  |  |
| 293.15                                                                                                                                                   | 0.0<br>0.428<br>0.559<br>0.669<br>1.066<br>1.269<br>2.612                                                                                                                                                                                                                                                         | 11.11 (S <sup>O</sup> )<br>10.13<br>9.81<br>9.50<br>8.88<br>8.33<br>6.26                                                                                                                                                                         | 11.13 (S' <sup>O</sup> )<br>10.32<br>10.04<br>9.77<br>9.28<br>8.77<br>6.96                                    | 0.0767<br>0.0801<br>0.0846<br>0.0741<br>0.0781                                                    |  |  |  |
|                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   | k = 0.0791                                                                                                                                                                                                                                       | - 0.0011 m                                                                                                    |                                                                                                   |  |  |  |
| 1                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                   | "s'                                                                                                                                                                                                                                              |                                                                                                               |                                                                                                   |  |  |  |
|                                                                                                                                                          | At one n                                                                                                                                                                                                                                                                                                          | nolal CsCl, k <sub>s</sub> , = 0                                                                                                                                                                                                                 | .0780 and $k_{sX} =$                                                                                          | 0.0934.                                                                                           |  |  |  |
| *The no<br>The va<br>of k <sub>s</sub><br>The no                                                                                                         | *The neon solubility, S, is the same as the Ostwald coefficient x $10^3$ .<br>The values of $k_s$ , and $k_{sx}$ were calculated by the compiler. The values<br>of $k_s$ , are based on the neon solubility ratio per kg H <sub>2</sub> O.<br>The neon solubility in water, S <sup>o</sup> , is from reference 1. |                                                                                                                                                                                                                                                  |                                                                                                               |                                                                                                   |  |  |  |
| <u> </u>                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                  |                                                                                                               |                                                                                                   |  |  |  |
|                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   | AUXILIARY                                                                                                                                                                                                                                        | INFORMATION                                                                                                   |                                                                                                   |  |  |  |
| METHOD:<br>The<br>earlie:<br>design<br>appara<br>differd<br>differd<br>differd<br>comple<br>contac<br>total p<br>739 ±<br>pressur<br>k <sub>SX</sub> was | apparatus, de<br>r paper (1), v<br>of Ben-Naim a<br>tus is designe<br>ence in volume<br>ution and afte<br>te, with the of<br>t at constant<br>pressure of ga<br>1.5 mmHg. The<br>re is 721.5 mm<br>s calculated h                                                                                                 | escribed in an<br>was based on the<br>and Baer (2). The<br>ed to measure the<br>e of the gas before<br>er dissolution is<br>gas and solvent in<br>pressure. The<br>as + water vapor is<br>e neon partial<br>mHg. The value of<br>by the compiler | SOURCE AND PURITY<br>1. Neon. Espe<br>Contained 0<br>gases.<br>2. Water. Dou<br>3. Cesium chlo<br>pure grade. | OF MATERIALS:<br>cially pure grade.<br>.1 per cent of other<br>bly distilled.<br>ride. Chemically |  |  |  |
| and that Henry's law is obeyed.                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                  | ESTIMATED ERROR:                                                                                              |                                                                                                   |  |  |  |
| The<br>solution<br>ment watch                                                                                                                            | concentration<br>on after the s<br>as determined                                                                                                                                                                                                                                                                  | n of CsCl in the<br>solubility experi-<br>by titration of                                                                                                                                                                                        | δS                                                                                                            | /S = 0.005                                                                                        |  |  |  |
|                                                                                                                                                          | . by ng (NO3) 2                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                  | REFERENCES:<br>1. Borina, A.F<br>Zh. Fiz. Kh                                                                  | .; Lyashchenko, A.K.<br><u>im</u> . 1971, <u>45</u> , 1316.                                       |  |  |  |
|                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                  | 2. Ben-Naim, A<br>Trans. Fara                                                                                 | .; Baer, S.<br>Iday <u>Soc</u> .1963, <u>59</u> ,2735.                                            |  |  |  |
|                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                  |                                                                                                               |                                                                                                   |  |  |  |

| COMPONENTS:                                                                                                                                                                                                                                                                                   | ORIGINAL MEASUREMENTS:                                                                                                                                      |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                        | Lyashchenko, A.K.                                                                                                                                           |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                         |                                                                                                                                                             |  |  |
| 3. Cesium Nitrate; CsNO <sub>3</sub> ; 7789-18-6                                                                                                                                                                                                                                              | Dokl. Akad. Nauk SSSR 1974, 217 (2),<br>380-382; Dokl. Phys. Chem. (Engl.<br>trans.) 1974, 217, 645 - 647.                                                  |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                    | PREPARED BY:                                                                                                                                                |  |  |
| T/K: 293.15 - 303.15<br>Total P/kPa: 98.525 (739 mmHg)<br>CsNO <sub>3</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.15                                                                                                                                                                  | T.D. Kittredge, H.L. Clever                                                                                                                                 |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                          |                                                                                                                                                             |  |  |
| T/K Cesium Neon Solu<br>Nitrate                                                                                                                                                                                                                                                               | pility* Setschenow<br>Parameter                                                                                                                             |  |  |
| mol kg <sup>-1</sup> H <sub>2</sub> OS/cm <sup>3</sup>                                                                                                                                                                                                                                        | $\frac{dm^{-3}}{s} \qquad \frac{k_s = (1/m) \log (s^{0}/s)}{s}$                                                                                             |  |  |
| 293.15         0         11.12           0.48         9.89           1.15         8.34                                                                                                                                                                                                        | (S <sup>O</sup> )<br>0.1052<br>0.1083                                                                                                                       |  |  |
| k <sub>s</sub> = 0.1030                                                                                                                                                                                                                                                                       | + 0.0046 m                                                                                                                                                  |  |  |
| At one molal $CsNO_3$ , $k_s = 0$                                                                                                                                                                                                                                                             | 0.1076 and k <sub>sX</sub> = 0.0961.                                                                                                                        |  |  |
| 303.15 0 10.5                                                                                                                                                                                                                                                                                 | (S <sup>O</sup> ) –                                                                                                                                         |  |  |
| 1.10 8.65                                                                                                                                                                                                                                                                                     | 0.0799                                                                                                                                                      |  |  |
| $k_{s} = 0.0691$                                                                                                                                                                                                                                                                              | + 0.0098 m                                                                                                                                                  |  |  |
| At one molal CsNO <sub>3</sub> , k <sub>s</sub> = 0                                                                                                                                                                                                                                           | 0.0789 and k <sub>sX</sub> = 0.0660.                                                                                                                        |  |  |
| *The neon solubility, S, is the same<br>The Setschenow parameters k <sub>s</sub> and k <sub>sX</sub><br>The neon solubility in water, S <sup>O</sup> , is                                                                                                                                     | as the Ostwald coefficient x 10 <sup>3</sup> .<br>were calculated by the compiler.<br>from references 1 and 2.                                              |  |  |
| AUXILIARY                                                                                                                                                                                                                                                                                     | INFORMATION                                                                                                                                                 |  |  |
| METHOD:                                                                                                                                                                                                                                                                                       | SOURCE AND PURITY OF MATERIALS:                                                                                                                             |  |  |
| The apparatus, described in earlies<br>papers (1,2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before                                                                                             | <ol> <li>Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> <li>Water. Doubly distilled.</li> </ol>                           |  |  |
| dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor<br>is 739 $\pm$ 1.5 mmHg. The neon partial<br>pressure over water is 721.5 mmHg.<br>The value of $k_{\rm ev}$ was calculated by the | 3. Cesium nitrate. Chemically pure grade.                                                                                                                   |  |  |
| compiler assuming that the gas                                                                                                                                                                                                                                                                | ESTIMATED ERROR: $\delta T/K = 0.02$                                                                                                                        |  |  |
| is obeyed.<br>The CsNO <sub>3</sub> concentration in the                                                                                                                                                                                                                                      | $\delta P/mmHg = 1.5$<br>$\delta S/cm^3 dm^{-3} = 0.04$                                                                                                     |  |  |
| solution after degassing and at the                                                                                                                                                                                                                                                           | $\delta m/m = 0.02$                                                                                                                                         |  |  |
| end of the solubility experiment was<br>determined by comparison of the solu-<br>tion density with standard density<br>tabulations.                                                                                                                                                           | <pre>LFERENCES: 1. Borina, A.F.; Lyashchenko, A.K.     Zh. Fiz. Khim. 1971, 45, 1316. 2. Borina, A.F.; Samoilov, O. Ya.;</pre>                              |  |  |
|                                                                                                                                                                                                                                                                                               | Alekseeva, L.S.<br><u>Zh. Fiz. Khim</u> . 1971, <u>45</u> , 2554.<br>3. Ben-Naim, A.; Baer, S.<br><u>Trans. Faraday</u> <u>Soc</u> . 1963, <u>59</u> ,2735. |  |  |

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ORIGINAL MEASUREMENTS:                                                               |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--|--|
| l. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Morrison, T.J.; Johnstone, N.B.B.                                                    |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |  |  |
| 3. Alkali Halides                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <u>J. Chem. Soc</u> . 1955, 3655 - 3659.                                             |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | PREPARED BY:                                                                         |  |  |
| T/K: 298.15<br>P/kPa: 101 325 (1 atm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | T.D.Kittredge                                                                        |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                      |  |  |
| $T/K$ $K_s = (1/m) \log (S^{2}/S)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | $ \sum_{x \in X} = (1/m) \log (x^{0}/x) $                                            |  |  |
| Lithium Chloride; LiCl; 7447                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -41-8                                                                                |  |  |
| 298.15 0.059                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.074                                                                                |  |  |
| Sodium Chloride; NaCl; 7647-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ·14-5                                                                                |  |  |
| 298.15 0.097                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.112                                                                                |  |  |
| Potassium Iodide; KI; 7681-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | .1-0                                                                                 |  |  |
| 298.15 0.080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.095                                                                                |  |  |
| determined from only two solubility measurements. They were the solubility<br>of neon in pure water, S <sup>o</sup> , and the solubility of neon in a near one equiva-<br>lent of salt per kg of water solution, S. No solubility values are given in<br>the paper. The S <sup>o</sup> /S ratio was referenced to a solution containing one kg<br>of water. The compiler calculated the the salt effect parameter $k_{SX}$ from<br>the mole fraction solubility ratio X <sup>o</sup> /X. The electrolytes were assumed to<br>100 per cent dissociated and both cation and anion were used in the mole<br>fraction calculation. |                                                                                      |  |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | INFORMATION                                                                          |  |  |
| METHOD:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SOURCE AND PURITY OF MATERIALS:                                                      |  |  |
| Gas absorption in a flow system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1. Neon. British Oxygen Co. Ltd.                                                     |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2. Water. No information given.                                                      |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 3. Electrolyte. No information given.                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |  |  |
| APPARATUS/PROCEDURE:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIMATED ERROR:                                                                     |  |  |
| The providually decreased solvert flows                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $\delta k_{-} = 0.010$                                                               |  |  |
| in a thin film down an absorption                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0Kg - 0.010                                                                          |  |  |
| spiral containing neon gas plus<br>solvent vapor at a total pressure of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | REFERENCES :                                                                         |  |  |
| one atm. The volume of gas absorbed<br>is measured in attached calibrated<br>burets (1).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ol> <li>Morrison, T.J.; Billett, F.<br/>J. <u>Chem.</u> Soc. 1952, 3819.</li> </ol> |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |  |  |

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**ORIGINAL MEASUREMENTS:** COMPONENTS: Lvashchenko, A.K.; Borina, A.F. 1. Neon; Ne; 7440-01-9 2. Water; H<sub>2</sub>O; 7732-18-5 3. Alkali Halides Zh. Strukt. Khim. 1971, 12, 964 - 968. J. Struct. Chem. 1971, 12, 889 - 891. VARIABLES: PREPARED BY: T/K: 293.15 98.525 (739 mmHg) Total P/kPa: T.D.Kittredge, H.L.Clever EXPERIMENTAL VALUES: T/K Alkali Halide Neon Solubility  $k_s = (1/m) \log (S^{O}/S)$ mol kg<sup>-1</sup>  $H_2O$  S/cm<sup>3</sup> dm<sup>-3</sup> Potassium Fluoride; KF; 7789-23-3 293.15 11.11 0 0.57 9.36 0.1306 1.39 7.66 0.1162 1.57 7.33 0.1050 0.1166 1.72 7.00 3.07 5.10 0.1101  $k_{\rm S} = 0.1276 - 0.0071 \,\mathrm{m}$ At one molal KF,  $k_s = 0.121$  and  $k_{sx} = 0.132$ . Rubidium Chloride; RbCl; 7791-11-9 293.15 11.11 Λ 0.172 10.62 0.1139 9.82 0.474 0.1131 0.577 9.69 0.1029 1.018 8.61 0.1088 1.14 8.51 0.1017  $k_s = 0.1146 - 0.0097 m$ At one molal RbCl,  $k_s = 0.105$  and  $k_{sX} = 0.103$ <sup>\*</sup>The neon solubility, S, is the same as the Ostwald coefficient x 10<sup>3</sup>. The neon solubility in water, S<sup>O</sup>, is from references 1 and 2. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD: The apparatus, described in an earlier paper (1), was based on the design of 1. Neon.Especially pure grade. Contained 0.1 percent of other Ben-Naim and Baer (3). The apparatus gases. is designed to measure the difference in volume of the gas before dissolution 2. Alkali halides. Chemical pure reagent grade. and after dissolution is complete with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5. The value of k<sub>SX</sub> was calculated by the compiler assuming that gas behavior is ideal and that Henry's law is obeyed. ESTIMATED ERROR: The KF concentration was determined  $\delta S/S = 0.005$ after degassing by titration of the F with Al(NO3)3. The RbCl concentration was determined after degassing by titration with  $Hg(NO_3)_2$ . **REFERENCES:** The Setschenow parameters ks and ksx 1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316. were calculated by the compiler. 2. Lyashchenko, A.K. 3. Ben-Naim, A.; Baer, S. Dokl. Akad. Nauk. SSSR 1974, 217, Trans. Faraday Soc. 1963, 59, 2735. 380.

| COMPONENTS:                                                                 |                                                                                 |                                               | ORIGINAL MEASUREMENTS:                                               |                                                                                       |  |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
| l. Neon; 1                                                                  | Ne; 7440-01-9                                                                   |                                               | Borina, A.F.; Samoilov, O. Ya.                                       |                                                                                       |  |
| 2. Water;                                                                   | H <sub>2</sub> O; 7732-18-5                                                     |                                               |                                                                      |                                                                                       |  |
| 3. Alkali Halides                                                           |                                                                                 |                                               | <u>Zh. Strukt. K</u><br>J. Struct. Ch                                | <u>him</u> . 1974, <u>15</u> , 395 - 402.<br><u>em</u> . 1974, <u>15</u> , 336 - 342. |  |
| VARIABLES:                                                                  | - /                                                                             |                                               | PREPARED BY:                                                         |                                                                                       |  |
| Total P/I<br>Salt/mol                                                       | F/K: 288.15 - 29<br>kPa: 98.659 (74<br>kg <sup>-1</sup> H <sub>2</sub> O: 0 - 4 | 8.15<br>0 mmHg)<br>.377                       | H. L. Clever<br>T. D. Kittredge                                      |                                                                                       |  |
| EXPERIMENTAL                                                                | VALUES:                                                                         |                                               |                                                                      |                                                                                       |  |
| т/к                                                                         | Alkali<br>Halide                                                                | Mol Fraction X <sub>1</sub> x 10 <sup>9</sup> | Mol Fraction $X_1 \times 10^4$                                       | Setschenow Salt<br>Parameter                                                          |  |
|                                                                             | mol kg <sup>-1</sup> H <sub>2</sub> O                                           | at 1 mmHg                                     | at <sup>-</sup> 1 atm                                                | $k_{s} = (1/m) \log(X^{o}/X)$                                                         |  |
| Lithium                                                                     | Chloride; LiCl;                                                                 | 7447-41-8                                     | 0.0000                                                               |                                                                                       |  |
| 288.15                                                                      | 0<br>0.426                                                                      | 11.39<br>10.24                                | 0.0866<br>0.0778                                                     | _<br>0.1085                                                                           |  |
|                                                                             | 0.800                                                                           | 9.74                                          | 0.0740                                                               | 0.0850                                                                                |  |
|                                                                             | 1.489                                                                           | 9.07                                          | 0.0689                                                               | 0.0837                                                                                |  |
|                                                                             | 1.589                                                                           | 8.34                                          | 0.0634                                                               | 0.0852                                                                                |  |
|                                                                             | 3.088                                                                           | 6.29                                          | 0.0478                                                               | 0.0835                                                                                |  |
| 293.15                                                                      | 0.483                                                                           | 10.98                                         | 0.08345                                                              | 0.0769                                                                                |  |
|                                                                             | 0.864                                                                           | 9.25                                          | 0.0703                                                               | 0.0862                                                                                |  |
|                                                                             | 1.162                                                                           | 8.86                                          | 0.0673                                                               | 0.0802                                                                                |  |
|                                                                             | 2.138                                                                           | 7.49                                          | 0.0569                                                               | 0.0777                                                                                |  |
|                                                                             | 2.987                                                                           | 6.54                                          | 0.0497                                                               | 0.0753                                                                                |  |
| 298.15                                                                      | 0.330                                                                           | 10.58                                         | 0.0804                                                               | 0.0663                                                                                |  |
|                                                                             | 0.935                                                                           | 8.97                                          | 0.0682                                                               | 0.0767                                                                                |  |
|                                                                             | 1.270                                                                           | 8.52                                          | 0.0648                                                               | 0.0741<br>0.0784                                                                      |  |
|                                                                             | 3.277                                                                           | 6.05                                          | 0.0460                                                               | 0.0741                                                                                |  |
| Table co                                                                    | ntinued on next                                                                 | page.                                         |                                                                      |                                                                                       |  |
|                                                                             |                                                                                 | AUXILIARY                                     | INFORMATION                                                          |                                                                                       |  |
| METHOD/APPA                                                                 | ARATUS/PROCEDURE                                                                | :                                             | SOURCE AND PURIT                                                     | Y OF MATERIALS:                                                                       |  |
| Dapers (1                                                                   | aratus, describe<br>.2). was based o                                            | d in earlier<br>n the design                  | 1. Neon. Spec                                                        | ially pure grade.                                                                     |  |
| of Ben-Nai                                                                  | m and Baer (3).                                                                 | The appa-                                     | gases.                                                               | o.i per cent of other                                                                 |  |
| ratus is c<br>difference                                                    | lesigned to meas<br>in volume of t                                              | ure the<br>he gas before                      | 2. Water. Dis                                                        | tilled.                                                                               |  |
| dissolutio                                                                  | on and after dis                                                                | solution is                                   | 3 Salts No                                                           | information given                                                                     |  |
| complete w                                                                  | vith the gas and<br>constant press                                              | solvent in<br>ure.The total                   |                                                                      |                                                                                       |  |
| pressure c                                                                  | of neon + water                                                                 | vapor was                                     |                                                                      |                                                                                       |  |
| always 740                                                                  | ) mmHg during th<br>ors assume idea                                             | e measurement<br>1 gas                        |                                                                      |                                                                                       |  |
| behavior a                                                                  | ind that Henry's                                                                | law is                                        |                                                                      |                                                                                       |  |
| obeyed to convert the experimentally<br>measured Ostwald coefficient to the |                                                                                 |                                               | ESTIMATED ERROR:                                                     |                                                                                       |  |
| inverse of                                                                  | Henry's constant                                                                | nt.                                           |                                                                      | $\delta x_1 / x_1 = 0.0035$                                                           |  |
| See the                                                                     | last page of the                                                                | e compilation                                 |                                                                      |                                                                                       |  |
| of data f                                                                   | rom this paper                                                                  | for the                                       | DEFEDENCES                                                           |                                                                                       |  |
| one molal                                                                   | electrolyte co                                                                  | ncentration.                                  | 1. Lyashchenko                                                       | o, A.K.; Borina, A.F.                                                                 |  |
|                                                                             |                                                                                 |                                               | 2 Zh. Strukt                                                         | . Khim. 1971, <u>12</u> , 964.                                                        |  |
|                                                                             |                                                                                 |                                               | 2. Borina, A.F.; Lyashchenko, A.K.<br>Zh. Fiz. Khim. 1971, 45, 1316. |                                                                                       |  |
|                                                                             |                                                                                 |                                               | 3. Ben-Naim, 7                                                       | A.; Baer, S.                                                                          |  |
|                                                                             |                                                                                 |                                               |                                                                      | <u>1007</u> <u>500</u> , 1903, <u>59</u> ,2735,                                       |  |

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| COMPONENTS: |                                       |                                       |                               | ORIGINAL MEASUREMENTS:         |                                         |
|-------------|---------------------------------------|---------------------------------------|-------------------------------|--------------------------------|-----------------------------------------|
| 1.          | 1. Neon; Ne; 7440-01-9                |                                       |                               | Borina, A.F.; Samoilov, O. Ya. |                                         |
| 2.          | 2. Water; H <sub>2</sub> O; 7732-18-5 |                                       |                               | <u>Zh. Strukt. Khi</u>         | <u>m</u> . 1974, <u>15</u> , 395 - 402. |
| 3.          | 3. Alkali Halides                     |                                       | Continued from previous page. |                                |                                         |
|             | т/к                                   | Alkali Halide                         | Mol Fractio                   | n Mol Fraction                 | Setschenow Salt                         |
|             |                                       | mol kg <sup>-1</sup> H <sub>2</sub> O | $X_1 \times 10^9$ at 1 mmHg   | $X_1 \times 10^4$ at 1 atm     | Parameter<br>$k_s = (1/m) \log (X^O/X)$ |
|             | Lithium                               | Iodide; LiI;                          | 10377-51-2                    |                                |                                         |
|             | 288.15                                | 0                                     | 11.39                         | 0.0866                         | -                                       |
|             |                                       | 0.654                                 | 9.82                          | 0.0746                         | 0.0995                                  |
|             |                                       | 0.955                                 | 9.18                          | 0.0698                         | 0.0981                                  |
|             |                                       | 2.358                                 | 7.11                          | 0.0540                         | 0.0868                                  |
|             | 293.15                                | 0                                     | 10.98                         | 0.08345                        | -                                       |
|             |                                       | 1.083                                 | 8.78<br>8.19                  | 0.0667<br>0.0622               | 0.0897<br>0.0946                        |
|             |                                       | 1.701                                 | 7.77                          | 0.0591                         | 0.0883                                  |
|             | 200 15                                | 2.350                                 | 7.23                          | 0.0550                         | 0.0772                                  |
|             | 298.15                                | 0.433                                 | 9.72                          | 0.0739                         | 0.0850                                  |
|             |                                       | 0.433                                 | 9.67                          | 0.0735                         | 0.0902                                  |
|             |                                       | 1.020                                 | 8.84                          | 0.0672                         | 0.0765                                  |
|             |                                       | 2.330                                 | 7.20                          | 0.0547                         | 0.0717                                  |
|             | Sodium (                              | Chloride; NaCl;                       | 7647-14-5                     | 0.0000                         |                                         |
|             | 288.15                                | 0<br>0.349                            | 10.28                         | 0.0866                         | 0.1276                                  |
|             |                                       | 0.715                                 | 9.33                          | 0.0709                         | 0.1211                                  |
|             |                                       | 2.341                                 | 6.02                          | 0.0458                         | 0.1183                                  |
|             |                                       | 4.377                                 | 3.75                          | 0.0285                         | 0.1102                                  |
|             | 293.15                                | 0<br>0.248                            | 10.98<br>10.31                | 0.08345                        | 0.1103                                  |
|             |                                       | 0.658                                 | 9.20                          | 0.0699                         | 0.1167                                  |
|             |                                       | 1.701                                 | 8.47<br>6.93                  | 0.0527                         | 0.1175                                  |
|             |                                       | 2.188                                 | 6.32                          | 0.0480                         | 0.1096                                  |
|             | 298.15                                | 0                                     | 10.58                         | 0.0804                         | -<br>0-0995                             |
|             |                                       | 0.590                                 | 9.19                          | 0.0698                         | 0.1036                                  |
|             |                                       | 1.075                                 | 8.20<br>7.28                  | 0.0623<br>0.0553               | 0.1030                                  |
|             |                                       | 2.070                                 | 6.40                          | 0.0486                         | 0.1055                                  |
|             | 202 15                                | 3.070                                 | 5.2/                          | 0.0401<br>0.0801               | 0.0980                                  |
|             | 203.12                                | 1.184                                 | 7.68                          | 0.0584                         | 0.1161                                  |
|             |                                       | 1.616                                 | 7.14                          | 0.0543                         | 0.1047                                  |
|             |                                       | 2.824                                 | 5.29                          | 0.0402                         | 0.1060                                  |
|             | Sodium 3                              | Iodide; NaI; 7                        | 681-82-5                      |                                |                                         |
|             | 288.15                                | 0                                     | 11.39                         | 0.0866                         | -<br>0 1355                             |
|             |                                       | 0.666                                 | 9.36                          | 0.0711                         | 0.1280                                  |
|             |                                       | 1.117                                 | 8.29<br>5,98                  | 0.0630<br>0.0455               | 0.1235<br>0.1152                        |
|             |                                       | 2.879                                 | 5.24                          | 0.0398                         | 0.1171                                  |
|             | 293.15                                | 0                                     | 10.98                         | 0.08345                        | -<br>0 1083                             |
|             |                                       | 0.327                                 | 9.52                          | 0.0724                         | 0.0952                                  |
|             |                                       | 1.038                                 | 8.44                          | 0.0641                         | 0.1101<br>0.1024                        |
|             |                                       | 2.023                                 | 6.78                          | 0.0515                         | 0.1035                                  |
|             | Table co                              | ntinued on next                       | page.                         |                                |                                         |

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| COMPONENTS:                           |                  |                   | ORIGINAL MEASUREMENTS:                                         |                                        |
|---------------------------------------|------------------|-------------------|----------------------------------------------------------------|----------------------------------------|
| l. Neon; Ne; 7440-01-9                |                  |                   | Borina, A.F.; Samoilov, O. Ya.                                 |                                        |
| 2. Water; H <sub>2</sub> O; 7732-18-5 |                  |                   | <u>Zh. Strukt</u> . <u>Khim</u> . 1974, <u>15</u> , 395 - 402. |                                        |
| 3. Alkali H                           | lalides          |                   | Continued from                                                 | previous page.                         |
|                                       |                  |                   |                                                                |                                        |
| т/к                                   | Alkali Halide    | Mol Fractio       | n Mol Fraction                                                 | Setschenow Salt                        |
|                                       | mol $ka^{-1}$ Ha | $X_1 \times 10^9$ | $X_1 \times 10^4$                                              | Parameter<br>k = $(1/m) \log(x^{Q}/x)$ |
| Sodium                                | Iodide: NaI: 76  | 81-82-5 (con      |                                                                | <u></u>                                |
| 298.15                                | 0                | 10.58             | 0.0804                                                         | -                                      |
|                                       | 0.540            | 9.34<br>8.61      | 0.0710                                                         | 0.1003                                 |
|                                       | 1.255            | 7.88              | 0.0599                                                         | 0.1020                                 |
|                                       | 1.500<br>3.200   | 7.53<br>5.14      | 0.0572<br>0.0391                                               | 0.0985<br>0.0980                       |
| Potassi                               | ium Chloride; KC | 1; 7447-40-7      |                                                                |                                        |
| 288.15                                | 0                | 11.39             | 0.0866                                                         | -                                      |
|                                       | 0.535            | 9.97<br>8.73      | 0.0758                                                         | 0.1091<br>0.1144                       |
|                                       | 1.556            | 7.89              | 0.0600                                                         | 0.1025                                 |
|                                       | 2.300<br>2.934   | 6.47<br>5.71      | 0.0492                                                         | 0.1068<br>0.1022                       |
|                                       | 3.369            | 5.44              | 0.0413                                                         | 0.0953                                 |
| 290.65                                | 0<br>1,234       | 11.19<br>8.22     | 0.0850                                                         | -<br>0.1085                            |
|                                       | 2.227            | 6.71              | 0.0510                                                         | 0.0997                                 |
| 202 15                                | 3.031            | 5.72              | 0.0435                                                         | 0.0962                                 |
| 293.15                                | 0.122            | 10.57             | 0.0803                                                         | 0.1355                                 |
|                                       | 0.225            | 10.33             | 0.0785                                                         | 0.1178<br>0.1135                       |
|                                       | 0.915            | 8.80              | 0.0669                                                         | 0.1050                                 |
|                                       | 1.892<br>3.485   | 7.09<br>5.25      | 0.0539                                                         | 0.1004<br>0.0919                       |
| 295.65                                | 0                | 10.78             | 0.0819                                                         | -                                      |
|                                       | 1.255            | 8.06              | 0.0613                                                         | 0.1006                                 |
|                                       | 2.430            | 6.26              | 0.0476                                                         | 0.0971                                 |
| 298.15                                | 0<br>0.500       | 10.58<br>9.57     | 0.0804<br>0.0727                                               | -<br>0.0871                            |
|                                       | 0.965            | 8.71              | 0.0662                                                         | 0.0875                                 |
|                                       | 1.865            | 7.82              | 0.0594                                                         | 0.0902                                 |
|                                       | 3.182            | 5.58<br>4 77      | 0.0424                                                         | 0.0873<br>0.0854                       |
| Potassi                               | ium Iodide; KI;  | 7681-11-0         |                                                                |                                        |
| 288.15                                | 0                | 11.39             | 0.0866                                                         | -                                      |
|                                       | 0.573<br>0.981   | 9.66<br>8.77      | 0.0734<br>0.0667                                               | 0.1249<br>0.1157                       |
|                                       | 1.870            | 7.27              | 0.0553                                                         | 0.1043                                 |
| 200 65                                | ∠.∀∠∀<br>∩       | 5.6/<br>11 19     | 0.0431                                                         | -                                      |
| 230.05                                | 1.630            | 7.62              | 0.0579                                                         | 0.1024                                 |
|                                       | 2.350<br>3.200   | 6.52<br>5.58      | 0.0496<br>0.0424                                               | 0.0998<br>0.0944                       |
| 293.15                                | 0                | 10.98             | 0.08345                                                        | -                                      |
|                                       | 0.398            | 9.93              | 0.0755                                                         | 0.1097<br>0.0945                       |
|                                       | 1.534            | 7.93              | 0.0603                                                         | 0.0921                                 |
|                                       | 2.682            | 6.25              | 0.0475                                                         | 0.0912                                 |

Table continued on next page.

| COMPONENTS:                                                        |                                                                                           |                                                                      |                                                                                  |                                                                        |
|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                             |                                                                                           |                                                                      | Borina, A.F.; Samoilov, O.Ya.                                                    |                                                                        |
| 2. Water; H <sub>2</sub> 0;7732-18-5                               |                                                                                           |                                                                      | Zh. Strukt. Khim                                                                 | <u>1</u> . 1974, <u>15</u> , 395 - 402.                                |
| 3. Alkali                                                          | Halides                                                                                   |                                                                      | Continued from p                                                                 | revious page.                                                          |
|                                                                    |                                                                                           |                                                                      |                                                                                  |                                                                        |
| m /12                                                              | Alkali Ualida                                                                             |                                                                      |                                                                                  |                                                                        |
| 17K                                                                |                                                                                           | $X_1 \times 10^9$                                                    | $X_1 \times 10^4$                                                                | Parameter                                                              |
|                                                                    | $\frac{\text{mol } kg^{-1} H_2O}{}$                                                       | at 1 mmHg                                                            | at 1 atm                                                                         | $\frac{k_s = (1/m) \log (X^0/X)}{2}$                                   |
| Potass                                                             | ium Iodide; KI;                                                                           | 7681-11-0 (                                                          | continued)                                                                       |                                                                        |
| 295.65                                                             | 0                                                                                         | 10.78                                                                | 0.0819                                                                           | -<br>0.1026                                                            |
|                                                                    | 1.777                                                                                     | 7.37                                                                 | 0.0560                                                                           | 0.0929                                                                 |
| 200 15                                                             | 2.887                                                                                     | 5.99                                                                 | 0.0455                                                                           | 0.0884                                                                 |
| 290.15                                                             | 0.555                                                                                     | 9.43                                                                 | 0.0717                                                                           | 0.0900                                                                 |
|                                                                    | 0.845                                                                                     | 8.74                                                                 | 0.0664                                                                           | 0.0982                                                                 |
|                                                                    | 1.900                                                                                     | 7.02                                                                 | 0.0534                                                                           | 0.0938                                                                 |
|                                                                    | 3.270                                                                                     | 5.55                                                                 | 0.0422                                                                           | 0.0857                                                                 |
| · · · · · · · · · · · · · · · · · · ·                              |                                                                                           |                                                                      |                                                                                  |                                                                        |
| The mole f<br>Setschenow<br>The values<br>were inter<br>ature valu | raction solubil<br>salt effect pa<br>of the solubil<br>polated from th<br>es by the compi | ity of neon<br>arameters wer<br>ity of neon<br>he authors so<br>ler. | at 101.325 kPa (1<br>e calculated by t<br>in water at 290.6<br>lubility values a | atm) and the<br>the compiler.<br>5 and 295.65 K<br>t the other temper- |
| Solution                                                           | T/K Equati                                                                                | on Parameter                                                         | s Setschenow P                                                                   | arameters at<br>ectrolyte                                              |
| + salt                                                             | rs -                                                                                      |                                                                      |                                                                                  | $k_{SX} = $                                                            |
|                                                                    |                                                                                           |                                                                      | (1/m) log(S <sup>O</sup> /                                                       | $\frac{(1/m)\log(X^{\circ}/X)}{(1/m)\log(X^{\circ}/X)}$                |
| NaCl                                                               | 288.15 0.126                                                                              | 5 - 0.00375                                                          | m 0.123                                                                          | 0.131                                                                  |
|                                                                    | 293.15 0.111                                                                              | .8 + 0.0001  m                                                       | 0.112                                                                            | 0.120                                                                  |
|                                                                    | 303.15 0.103                                                                              | 36 + 0.0020  m                                                       | m 0.108                                                                          | 0.112                                                                  |
| NaT                                                                | 288 15 0 130                                                                              | )3 <b>-</b> 0 0053 m                                                 | 0.1250                                                                           | 0.133                                                                  |
| Nai                                                                | (omitted va                                                                               | alue at 0.578                                                        | m)                                                                               | 0.110                                                                  |
|                                                                    | 293.15 0.104<br>298.15 0.101                                                              | 15 - 0.0005 m<br>.4 - 0.0011 m                                       | 0.1040<br>0.1003                                                                 | 0.112                                                                  |
| T i Cl                                                             |                                                                                           |                                                                      | m 0.0951                                                                         | 0.0928                                                                 |
| DICI                                                               | 293.15 0.082                                                                              | 26 - 0.0022 m                                                        | 0.0804                                                                           | 0.0881                                                                 |
|                                                                    | 298.15 0.077                                                                              | 4 - 0.0009 m                                                         | 0.0765<br>330 m)                                                                 | 0.0842                                                                 |
|                                                                    | (Omitted Ag                                                                               | value at 0.                                                          | 550 m/                                                                           |                                                                        |
| LiI                                                                | 288.15 0.097<br>293.15 0.102                                                              | 79 - 0.00445 :<br>21 - 0.0099 m                                      | m 0.0934<br>0.0922                                                               | 0.101<br>0.100                                                         |
|                                                                    | (omitted kg                                                                               | value at 1.                                                          | 346 m)                                                                           | 0 0 0 0                                                                |
|                                                                    | 298.15 0.088                                                                              | 34 - 0.0078 m                                                        | 0.0806                                                                           | 0.088                                                                  |
| KCl                                                                | 288.15 0.114                                                                              | 14 - 0.0048 m                                                        | 0.1096                                                                           | 0.117                                                                  |
|                                                                    | 290.65 0.116<br>293.15 0.116                                                              | 54 - 0.0069 m<br>50 - 0.0074 m                                       | 0.1095                                                                           | 0.116                                                                  |
|                                                                    | (omitted kg                                                                               | value at 0.                                                          | 122 m)                                                                           | 0.100                                                                  |
| 1                                                                  | 295.65 0.104<br>298.15 0.089                                                              | 11 - 0.0032 m<br>03 - 0.0006 m                                       | 0.1009                                                                           | 0.0964                                                                 |
|                                                                    | 200 15 0 100                                                                              |                                                                      | 0 1174                                                                           | 0 125                                                                  |
| KI                                                                 | 288.15 0.125                                                                              | 52 - 0.0078 m<br>L2 - 0.0051 m                                       | 0.1061                                                                           | 0.114                                                                  |
|                                                                    | 293.15 0.10                                                                               | 53 - 0.0063 m                                                        | 0.0991                                                                           | 0.107                                                                  |
|                                                                    | 295.65 0.100                                                                              | 01 - 0.00405                                                         | m 0.0960<br>252 m)                                                               | 0.104                                                                  |
|                                                                    | 298.15 0.09                                                                               | 75 - 0.0029  m                                                       | 0.0946                                                                           | 0.102                                                                  |
|                                                                    |                                                                                           |                                                                      |                                                                                  |                                                                        |

| CONTROLING                                        |                            |                                                                     |                                                                                     |
|---------------------------------------------------|----------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                   |                            | ORIGINAL MEASUREMENTS:                                              |                                                                                     |
| 1. Neon; Ne; 7440-01-9                            |                            | Krestov, G.A                                                        | .; Patsatsiya, K.M.                                                                 |
| 2. water; H <sub>2</sub> O; 7732-18-9             | )                          |                                                                     |                                                                                     |
| 3. Methanol (Methyl Ald<br>67-56-1                | cohol); CH <sub>4</sub> O; | <u>Zh. Fiz. Khir</u><br><u>Russ. J. Phy</u><br>1971, <u>45</u> , 10 | m. 1971, <u>45</u> , 1768 - 1770.<br><u>s. Chem. (Engl. Transl</u> .)<br>00 - 1001. |
| VARIABLES:                                        |                            | PREPARED BY:                                                        |                                                                                     |
| T/K: 283.15 - 31<br>Total P/kPa: 101.325          | 13.15<br>(1 atm)           | P                                                                   | . L. Long                                                                           |
| EXPERIMENTAL VALUES: T/K                          | Mol Fraction               | Bunsen                                                              | Bunsen                                                                              |
|                                                   | Methanol                   | Coefficient                                                         | Coefficient                                                                         |
|                                                   | ^3                         | at 1 atm<br>Total                                                   | at 1 atm Ne<br>Pressure                                                             |
|                                                   |                            | Pressure                                                            | n n 10 <sup>2</sup>                                                                 |
|                                                   |                            | α x 10 <sup>-</sup>                                                 | <u> </u>                                                                            |
| 283.15                                            | 0.00                       | 1.092                                                               | 1.105                                                                               |
|                                                   | 0.10                       | 1.118                                                               | 1.138                                                                               |
|                                                   | 0.20                       | 1.074                                                               | 1.100                                                                               |
|                                                   | 0.40                       | 2.000                                                               | 2.086                                                                               |
|                                                   | 0.80                       | 2.778                                                               | 2.920                                                                               |
| 293.15                                            | 0.00                       | 1.045                                                               | 1.085                                                                               |
|                                                   | 0.05                       | 1.100                                                               | 1.132                                                                               |
|                                                   | 0.20                       | 1.075                                                               | 1.127                                                                               |
|                                                   | 0.40                       | 1.377                                                               | 1.470                                                                               |
|                                                   | 0.80                       | 2.812                                                               | 3.085                                                                               |
| 303,15                                            | 0.00                       | 1,002                                                               | 1.044                                                                               |
| 505.15                                            | 0.05                       | 1.050                                                               | 1.110                                                                               |
|                                                   | 0.10                       | 1.048                                                               | 1.125                                                                               |
|                                                   | 0.40                       | 1.406                                                               | 1.582                                                                               |
|                                                   | 0.60<br>0.80               | 2.074<br>2.850                                                      | 2.395<br>3.410                                                                      |
| Continued on next page.                           |                            |                                                                     |                                                                                     |
| AUXILIARY                                         |                            | INFORMATION                                                         |                                                                                     |
| METHOD:                                           |                            | SOURCE AND PUR                                                      | ITY OF MATERIALS:                                                                   |
| The apparatus (1) is a                            | a modification             | No informat                                                         | ion given.                                                                          |
| (2). Modifications inclu                          | ide the use of             |                                                                     |                                                                                     |
| a larger water thermosta                          | at, the ad-                |                                                                     |                                                                                     |
| dition of an attached de device, and a bubbler to | egassing<br>presaturate    |                                                                     |                                                                                     |
| the gas with solvent va                           | por.                       |                                                                     |                                                                                     |
| The authors label the                             | ir solubility              | }                                                                   |                                                                                     |
| values as Ostwald coeff:                          | icients, $\gamma^0$ .      |                                                                     |                                                                                     |
| with the results of othe                          | er authors                 |                                                                     |                                                                                     |
| for water, and the careful reading                |                            | ESTIMATED ERRO                                                      | R:                                                                                  |
| Laboratory convince the Evaluator                 |                            |                                                                     | $\delta \alpha / \alpha = 0.01$ (Compiler)                                          |
| that the solubility value                         | les are Bunsen             |                                                                     |                                                                                     |
| pressure of gas + solver                          | nt vapor                   |                                                                     |                                                                                     |
| pressure of one atm.                              | -                          | REFERENCES:                                                         |                                                                                     |
| The authors do not gu                             | ote a refer-               | Zh. Fiz.                                                            | a, K.M.; Krestov, G.A.<br>Khim. 1970, 44, 1835.                                     |
| ence for the vapor pres                           | sure of the                | 2 Por Noi-                                                          | ·                                                                                   |
| water + methanol mixtur                           | es.Thus we<br>version of   | Z. Ben-Naim,<br>Trans. Fa                                           | A.; Baer, S.<br>Araday Soc. 1963, 59, 2735.                                         |
| the Bunsen coefficent f                           | rom a total                |                                                                     | · · ·                                                                               |
| pressure of one atm to                            | one atm Ne.                | l                                                                   |                                                                                     |

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| COMPONENTS:                                                 |                                                              | ORIGINAL MEASUREMENTS:                                      |                                                                                           |
|-------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                      |                                                              | Krestov, G.A.; Patsatsiya, K.M.                             |                                                                                           |
| 2. Water; H <sub>2</sub> O; 7732-18-5                       |                                                              |                                                             |                                                                                           |
| 3. Methanol (Methyl Alcohol); CH <sub>4</sub> O;<br>67-56-1 |                                                              | Zh. Fiz. Khi<br>Russ. J. Phy<br>1971, <u>45</u> , 10        | <u>m</u> . 1971, <u>45</u> , 1768-1770.<br><u>7s. Chem. (Engl. Transl</u> .)<br>000-1001. |
| VARIABLES:                                                  | 1.5 010 15                                                   | PREPARED BY:                                                |                                                                                           |
| T/K: 283.<br>Total P/kPa: 101.                              | 15 - 313.15<br>325 (1 atm)                                   | Ρ.                                                          | L. Long                                                                                   |
| EXPERIMENTAL VALUES:                                        |                                                              |                                                             |                                                                                           |
| T                                                           | YK Mol Fraction<br>Methanol (<br>X <sub>3</sub>              | Bunsen<br>Coefficient<br>at 1 atm<br>Fotal<br>Pressure      | Bunsen<br>Coefficient<br>at 1 atm Ne<br>Pressure                                          |
|                                                             |                                                              | $\alpha \times 10^2$                                        | $\alpha \times 10^2$                                                                      |
| 313                                                         | 5.15<br>0.00<br>0.05<br>0.10<br>0.20<br>0.40<br>0.60<br>0.80 | 0.942<br>0.995<br>1.017<br>1.077<br>1.438<br>2.122<br>2.895 | 1.011<br>1.088<br>1.177<br>1.244<br>1.737<br>2.650<br>3.743                               |
|                                                             |                                                              |                                                             |                                                                                           |
| METHOD.                                                     |                                                              | SOURCE AND DUE                                              | DITY OF MATERIALS.                                                                        |
| METHOD:<br>See preceding page.                              |                                                              | See precedir                                                | ng page.                                                                                  |
| APPARATUS / PROCEDURE ·                                     | ······································                       | ESTIMATED ERRO                                              | OR:                                                                                       |
| See preceding page.                                         |                                                              | See precedir                                                | ng page.                                                                                  |
|                                                             |                                                              | REFERENCES:                                                 |                                                                                           |
|                                                             |                                                              | See precedir                                                | ng page.                                                                                  |

|                                                                                                                                                                                                                                                               |                                                                                                                                                                      |                                                                                                                                                                         | _                                                                           |                                                                                                                                                                      |                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMPONENTS:                                                                                                                                                                                                                                                   |                                                                                                                                                                      | ORIGINAL MEASUREMENTS:                                                                                                                                                  |                                                                             |                                                                                                                                                                      |                                                                                                                                                                         |
| l. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                        |                                                                                                                                                                      | Krestov, G.A.; Patsatsiya, K.M.                                                                                                                                         |                                                                             |                                                                                                                                                                      |                                                                                                                                                                         |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                         |                                                                                                                                                                      |                                                                                                                                                                         |                                                                             |                                                                                                                                                                      |                                                                                                                                                                         |
| 3. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5                                                                                                                                                                                       |                                                                                                                                                                      | <u>Izv</u> . <u>Vy</u><br><u>Khim</u> <u>Te</u>                                                                                                                         | <u>ssh</u> . <u>Uchebn</u> . <u>Z</u><br>khnol. 1969, <u>1</u>              | <u>aved</u> ., <u>Khim</u> .<br><u>2</u> , 1333-1337.                                                                                                                |                                                                                                                                                                         |
| VARIABLES                                                                                                                                                                                                                                                     | :                                                                                                                                                                    |                                                                                                                                                                         | PREPARED                                                                    | BY:                                                                                                                                                                  |                                                                                                                                                                         |
| Total                                                                                                                                                                                                                                                         | T/K: 283.15 - 313.15<br>Total P/kPa: 101.325 (1 atm)                                                                                                                 |                                                                                                                                                                         |                                                                             | P. L. Long                                                                                                                                                           |                                                                                                                                                                         |
| EXPERIMEN                                                                                                                                                                                                                                                     | TAL VALUES:                                                                                                                                                          |                                                                                                                                                                         |                                                                             |                                                                                                                                                                      |                                                                                                                                                                         |
| т/к                                                                                                                                                                                                                                                           | Mol Fraction<br>Ethanol<br>X3                                                                                                                                        | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \ge 10^2$                                                                                             | Т/К                                                                         | Mol Fraction<br>Ethanol<br>X3                                                                                                                                        | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \times 10^2$                                                                                          |
| 283.15                                                                                                                                                                                                                                                        | 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00 | 1.092<br>1.140<br>1.138<br>1.113<br>1.072<br>1.043<br>1.021<br>1.076<br>1.195<br>1.334<br>1.476<br>1.630<br>1.791<br>1.950<br>2.282<br>2.624<br>2.984<br>3.355<br>3.726 | 293.15                                                                      | 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00 | 1.045<br>1.091<br>1.092<br>1.062<br>1.029<br>1.008<br>1.027<br>1.074<br>1.216<br>1.362<br>1.507<br>1.662<br>1.826<br>1.994<br>2.335<br>2.675<br>3.035<br>3.402<br>3.772 |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                      | AUXILIARY                                                                                                                                                               | INFORMAT                                                                    | ION                                                                                                                                                                  |                                                                                                                                                                         |
| METHOD:                                                                                                                                                                                                                                                       |                                                                                                                                                                      |                                                                                                                                                                         | SOURCE A                                                                    | ND PURITY OF MATE                                                                                                                                                    | RIALS:                                                                                                                                                                  |
| The apparatus (1) is a modification<br>of the apparatus of Ben-Naim and Baer<br>(2). The modifications include the<br>use of a larger water thermostat, the<br>addition of a degassing device, and a<br>bubbler to presaturate the gas with<br>solvent vapor. |                                                                                                                                                                      | No inf                                                                                                                                                                  | ormation given                                                              |                                                                                                                                                                      |                                                                                                                                                                         |
| The authors label their solubility values as Ostwald coefficients, $\gamma^0$ .<br>However, comparison of their results with the results of other workers for                                                                                                 |                                                                                                                                                                      |                                                                                                                                                                         |                                                                             |                                                                                                                                                                      |                                                                                                                                                                         |
| water and ethanol, and the careful<br>reading of other papers from the<br>Ivanovo Laboratory convince the<br>Evaluator that the solubility values<br>are Bunsen coefficients measured at a                                                                    |                                                                                                                                                                      | ESTIMATE                                                                                                                                                                | 2D ERROR:<br>δα/α =                                                         | 0.01 (Compiler)                                                                                                                                                      |                                                                                                                                                                         |
| total pressure of gas + solvent vapor<br>pressure of one atm. A knowledge of<br>the solvent vapor pressure is required<br>to convert the above solubility<br>values to Bunsen coefficents at one<br>atm Ne pressure.                                          |                                                                                                                                                                      | REFERENC<br>1. Pats<br>"Repo<br>Conf<br>Alma                                                                                                                            | CES:<br>atsiya, K.M.;<br>ort on the Seco<br>Ference on Theo<br>A-Ata, 1968. | Krestov, G.A.<br>nd All-Union<br>ry of Solution,"                                                                                                                    |                                                                                                                                                                         |

2. Ben-Naim, A.; Baer, S. <u>Trans. Faraday Soc</u>. 1963, <u>59</u>, 2735.

.

atm Ne pressure.

| COMPONENTS:                                                             |                                                                                                                                                      | ORIGINAL MEASUREMENTS:                                                                                                                                                  |                     |                                                                                                                                                                              |                                                                                                                                                                         |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                  |                                                                                                                                                      | Krestov, G.A.; Patsatsiya, K.M.                                                                                                                                         |                     |                                                                                                                                                                              |                                                                                                                                                                         |
| 2. Water; H <sub>2</sub> O; 7732-18-5                                   |                                                                                                                                                      |                                                                                                                                                                         |                     |                                                                                                                                                                              |                                                                                                                                                                         |
| 3. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5 |                                                                                                                                                      | <u>Izv. Vyssh. Uchebn. Zaved., Khim.</u><br><u>Khim</u> <u>Tekhnol</u> . 1969, <u>12</u> , 1333-1337.                                                                   |                     |                                                                                                                                                                              |                                                                                                                                                                         |
| VARIABLES:                                                              |                                                                                                                                                      |                                                                                                                                                                         | PREPARED BY         | :                                                                                                                                                                            |                                                                                                                                                                         |
| T/K:<br>Total P/kPa:                                                    | T/K: 283.15 - 313.15<br>Total P/kPa: 101.325 (1 atm)                                                                                                 |                                                                                                                                                                         |                     | P.L. Long                                                                                                                                                                    |                                                                                                                                                                         |
| EXPERIMENTAL VALU                                                       | JES:                                                                                                                                                 |                                                                                                                                                                         |                     |                                                                                                                                                                              |                                                                                                                                                                         |
| K Mo.<br>Eti                                                            | l Fraction<br>hanol<br><sup>X</sup> 3                                                                                                                | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \times 10^2$                                                                                          | Т/К                 | Mol Fraction<br>Ethanol<br>X <sub>3</sub>                                                                                                                                    | Bunsen<br>Coefficient<br>at l atm<br>Total<br>Pressure<br>$\alpha \times 10^2$                                                                                          |
| 303.15                                                                  | 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00 | 1.002<br>1.024<br>1.023<br>1.005<br>0.975<br>C.966<br>0.983<br>1.072<br>1.234<br>1.387<br>1.556<br>1.716<br>1.860<br>2.047<br>2.397<br>2.746<br>3.102<br>3.471<br>3.826 | 313.15              | 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00 | 0.942<br>0.950<br>0.946<br>0.935<br>0.924<br>0.923<br>0.968<br>1.070<br>1.252<br>1.440<br>1.593<br>1.762<br>1.933<br>2.109<br>2.466<br>2.823<br>3.161<br>3.544<br>3.906 |
|                                                                         |                                                                                                                                                      |                                                                                                                                                                         |                     |                                                                                                                                                                              |                                                                                                                                                                         |
|                                                                         |                                                                                                                                                      | AUXILIARY                                                                                                                                                               | INFORMATION         |                                                                                                                                                                              |                                                                                                                                                                         |
| METHOD:                                                                 |                                                                                                                                                      |                                                                                                                                                                         | SOURCE AND          | PURITY OF MATERIA                                                                                                                                                            | ALS:                                                                                                                                                                    |
| See preceding                                                           | page.                                                                                                                                                |                                                                                                                                                                         | See prece           | ding page.                                                                                                                                                                   |                                                                                                                                                                         |
| APPARATUS/PROCEDURE:                                                    |                                                                                                                                                      | ESTIMATED ERROR:                                                                                                                                                        |                     |                                                                                                                                                                              |                                                                                                                                                                         |
| See preceding                                                           | page.                                                                                                                                                |                                                                                                                                                                         | See preceding page. |                                                                                                                                                                              |                                                                                                                                                                         |
|                                                                         |                                                                                                                                                      |                                                                                                                                                                         | REFERENCES          | :                                                                                                                                                                            |                                                                                                                                                                         |
|                                                                         |                                                                                                                                                      |                                                                                                                                                                         | See prece           | ding page.                                                                                                                                                                   |                                                                                                                                                                         |

| <u> </u>                               |                                         |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|----------------------------------------|-----------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| COMPONENTS                             | :                                       |                           | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        |                                         |                           | Borina, A.F.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| 1. Neon; Ne; 7440-01-9                 |                                         | )                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| l.                                     |                                         |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| 2. Water                               | с; H <sub>2</sub> O; 7732-18            | 3-5                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|                                        |                                         |                           | Zh. Fiz. Khim. 1977. 51. 138 - 142                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| 3. Urea;                               | $CH_{4}N_{2}O$ ((NH <sub>2</sub> )      | <sub>2</sub> CO); 57-13-6 | $\frac{1}{120} + \frac{1}{120} + \frac{1}$ |  |  |
|                                        |                                         |                           | <u>Kuss</u> . <u>0</u> . <u>1175</u> . <u>Chem</u> . 1577, <u>51</u> , 70-70.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
| VARTABLES                              |                                         |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|                                        | T/K: 288.15 -                           | 303.15                    | rkeraked bi:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| ]                                      | ·                                       |                           | H. L. Clever                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| Total P                                | /KPa: 98.659 (                          | (740 mmHg)                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Urea/mc                                | 51 kg - H <sub>2</sub> O: 0             | - 11                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| EXPERIMENT                             | AL VALUES:                              |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Т/К                                    | Urea                                    | Mol Fraction M            | Iol Fraction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|                                        | mol kg <sup>-1</sup> H <sub>2</sub> O   | $X_{1} \times 10^{9}$     | $X_1 \times 10^4$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|                                        | - <b>-</b>                              | at 1 mmHg                 | at l atm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
|                                        |                                         |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| 200 15                                 | 0                                       | 11 30                     | 0 0866                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| 208.15                                 | 0 603                                   | 10 80                     | 0.0821                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 1 125                                   | 10.53                     | 0.0800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 1 200                                   | 10.38                     | 0.0789                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 1 850                                   | 10,16                     | 0.0772                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| l                                      | 2,120                                   | 9.82                      | 0.0746                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 2 910                                   | 9.29                      | 0.0706                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| 1                                      | 4.810                                   | 8.45                      | 0.0642                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 5.040                                   | 8.37                      | 0.0636                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 7.670                                   | 7.78                      | 0.0591                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| -                                      | 9.080                                   | 7.40                      | 0.0562                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 10.960                                  | 7.17                      | 0.0545                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        |                                         |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| 293.15                                 | 0                                       | 10.98                     | 0.0835                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 0.612                                   | 10.51                     | 0.0799                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| [                                      | 1.191                                   | 10.34                     | 0.0786                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 1.695                                   | 9.92                      | 0.0754                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 2.370                                   | 9.36                      | 0.0711                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| ļ                                      | 3.785                                   | 8.90                      | 0.0676                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 4.950                                   | 8.25                      | 0.0627                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 5.555                                   | 8.18                      | 0.0622                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 6.950                                   | 7.67                      | 0.0583                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                        | 7.580                                   | 7.55                      | 0.0574                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| l                                      | 9.080                                   | /•35                      | 0.0559                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Table co                               | ontinued on nex                         | t page.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|                                        |                                         |                           | TNEODUATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 1                                      |                                         | AUXILIARY                 | INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| METHOD /A                              | PPARATUS/PROCE                          | DURE:                     | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| The appar                              | ratus deserib                           | od in combion             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| line appa                              | 1 2) was base                           | d on the design           | 1. Neon.Especially pure grade.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| of Bon-M                               | $\pm 121$ , was Dased<br>aim and Bacr ( | 3) The anna-              | contained 0.1 per cent of other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| ratus ie                               | designed to m                           | easure the diffe          | yases.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| lence in v                             | volume of the o                         | gas before disso          | 12. Water. Distilled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |
| lution a                               | nd after disso                          | lution is com-            | 3. Urea, Analytical reagent grade.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| plete wit                              | th the gas and                          | solvent in                | St bieu, imaijeibai ieugene grade,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| contact a                              | at constant pro                         | essure.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| The cal                                | lculation of the                        | he inverse Henry          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| constant                               | was described                           | by Borina and             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Samoilov                               | (4).                                    | -                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| The con                                | ncentration of                          | the urea so-              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| lution was checked on the basis of its |                                         | the basis of its          | ESTIMATED ERROR:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| density after each experimentThe cali- |                                         | erimentThe cali-          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| bration curves were prepared from      |                                         | epared from               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| density data from the literature and   |                                         | literature and            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| from the authors'own measurements.     |                                         | easurements.              | $\delta X_1 / X_1 = 0.0035 - 0.0050$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |
| The so                                 | Lubility measur                         | rement was                | REFERENCES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |
| Carried C                              | out at a total                          | pressure of               | I Luschchenko A K · Porina A P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| meon + Wa                              | ater vapor of 7                         | 40 mmHg. The              | Zh. Strukt, Khim. 1971. 12. 964                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Were cal                               | y values in the                         | he table above            | 2. Borina, A.F.: Lyashchenko, A.K.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| ll atm nor                             | ctial process                           | cher 1 mmHg or            | Zh. Fiz. Khim. 1971. 45. 1316.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|                                        | ciai pressure                           | or neon.                  | 3. Ben-Naim, A.; Baer, S.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |
| 1                                      |                                         |                           | Trans. Faraday Soc. 1963, 59,2735.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
|                                        |                                         |                           | 4. Borina, A.F.; Samoilov, O. Ya.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| L                                      |                                         |                           | Zh. Strukt, Khim, 1974, 15, 395.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |

| COMPONENTS    | • |
|---------------|---|
| COULD OUTPUTD | • |

- 1. Neon; Ne; 7440-01-9
- 2. Water; H<sub>2</sub>O; 7732-18-5
- 3. Urea;  $CH_4N_2O$  (( $NH_2$ )<sub>2</sub>CO);57-13-6

Borina, A. F. <u>Zh. Fiz. Khim</u>. 1977, <u>51</u>, 138 - 142.

Continued from previous page.

ORIGINAL MEASUREMENTS:

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EXPERIMENTAL DATA:
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| т/к    | Urea   | Mol Fraction<br>X <sub>1</sub> x 10 <sup>9</sup> | Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup> |
|--------|--------|--------------------------------------------------|--------------------------------------------------|
|        |        |                                                  |                                                  |
| 298.15 | 0      | 10.58                                            | 0.0804                                           |
|        | 0.897  | 9.92                                             | 0.0754                                           |
|        | 1.465  | 9.76                                             | 0.0742                                           |
|        | 2.172  | 9.51                                             | 0.0723                                           |
|        | 3.047  | 9.09                                             | 0.0691                                           |
|        | 4.500  | 8.41                                             | 0.0639                                           |
|        | 5.805  | 7.96                                             | 0.0605                                           |
|        | 6.000  | 7.88                                             | 0.0599                                           |
|        | 7.420  | 7.78                                             | 0.0591                                           |
|        | 8.350  | 7.67                                             | 0.0583                                           |
|        | 10.220 | 7.15                                             | 0.0543                                           |
| 303.15 | 0      | 10.54                                            | 0.0801                                           |
|        | 0.425  | 10.26                                            | 0.0780                                           |
|        | 1.080  | 9.96                                             | 0.0757                                           |
|        | 1.980  | 9.48                                             | 0.0720                                           |
|        | 2.917  | 9.10                                             | 0.0692                                           |
|        | 3.310  | 8.94                                             | 0.0679                                           |
|        | 4.225  | 8.58                                             | 0.0652                                           |
|        | 6.460  | 7.97                                             | 0.0606                                           |
|        | 7.740  | 7.76                                             | 0.0590                                           |
|        | 8.100  | 7.72                                             | 0.0587                                           |
|        | 10.420 | 7.05                                             | 0.0536                                           |
|        | 11.070 | 7.05                                             | 0.0536                                           |
|        |        |                                                  |                                                  |

The inverse of the mole fraction solubility at 1 mmHg is the Henry constant K/mmHg =  $P/X_1$ 

The inverse of the mole fraction solubility at 1 atm pressure is the Henry constant K/atm =  $P/X_1$ .

The mole fraction solubility at 101.325 kPa (1 atm) was calculated by the compiler.

The original paper presents graphs of the enthalpy change and entropy change as a function of urea molality for the transfer on neon gas at a pressure of 101.325 kPa (1 atm) to the hypothetical solution of unit neon mole fraction.

| COMPONENTS .                                          |                                                          |
|-------------------------------------------------------|----------------------------------------------------------|
| 1 Norma No. 7440 01 0                                 | Veluce and T. Mersen S                                   |
| 1. Neon; Ne; 7440-01-9                                | Makranczy, J.; Megyery-Balog, K.;<br>Rusz, L.; Patyi, L. |
| 2. Pentane; C <sub>5</sub> H <sub>12</sub> ; 109-66-0 |                                                          |
|                                                       |                                                          |
|                                                       | Hung, J. Ind. Chem. 1976, 4, 269-280.                    |
| VARTABLES :                                           | DEFADED BY.                                              |
| т/к: 298.15                                           | PREFARED BI:                                             |
| P/kPa: 101.325 (1 atm)                                | S. A. Johnson                                            |
|                                                       |                                                          |
| EXPERIMENTAL VALUES:                                  |                                                          |
|                                                       |                                                          |
| T/K Mol Fraction                                      | Bunsen Ostwald                                           |
| $X_{1} \times 10^{4}$                                 | $\alpha \times 10^2$ L x $10^2$                          |
| 298.15 4.1                                            | 8.0 8.7                                                  |
|                                                       |                                                          |
| The mole fraction and Bunsen coeffici                 | ent were calculated by the compiler.                     |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
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|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
| AUXILIARY                                             | INFORMATION                                              |
| METHOD:                                               | SOURCE AND PURITY OF MATERIALS:                          |
| Volumetric method. The apparatus of                   | Both the gas and liquid were analyti-                    |
| used.                                                 | foreign origin. No further informa-                      |
|                                                       | tion.                                                    |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       |                                                          |
|                                                       | - ESTIMATED ERROR                                        |
| APPARATUS/PROCEDURE:                                  |                                                          |
|                                                       | $\delta X_1 / X_1 = 0.03$                                |
|                                                       |                                                          |
|                                                       | REFERENCES :                                             |
|                                                       | 1. Bodor, E.; Bor, Gy.; Mohai, B.;                       |
|                                                       | Veszpremi Vegyip. Eqv. Kozl.                             |
|                                                       | 1957, 1, 55;<br>Chom That 1061 55 21751                  |
|                                                       | <u>Chem. Abstr</u> . 1961, <u>55</u> , 31/5h.            |
|                                                       |                                                          |

COMPONENTS: ORIGINAL MEASUREMENTS: Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. 1. Neon; Ne; 7440-01-9 2. Hexane; C<sub>6</sub>H<sub>14</sub>; 110-54-3 J. Phys. Chem. 1957, 61, 1078-1083. VARIABLES: PREPARED BY: T/K: 287.15 - 311.85 P.L.Long P/kPa: 101.325 (1 atm) **EXPERIMENTAL VALUES:** T/K Mol Fraction Ostwald Bunsen Coefficient  $\propto x \ 10^2$ Coefficient  $X_1 \times 10^4$ L x 104 287.15 3.36 5.77 6.07 3.80 298.15 6.48 7.07 6.75 311.85 4.04 7.71 Smoothed Data:  $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln X_{1} = 5,443.6 + 47.425 T$ Std. Dev. AG<sup>O</sup> = 53.1, Coef. Corr. = 0.9959  $\Delta H^{O}/J \text{ mol}^{-1} = 5,443.6$ ,  $\Delta S^{O}/J \text{ K}^{-1} \text{ mol}^{-1} = -47.425$ Mol Fraction  $\Delta G^{O}/J \text{ mol}^{-1}$ т/к  $X_1 \times 10^{4}$ 3.44 19,109 288.15 3.57 293.15 19,346 19,583 298.15 3.71 303.15 3.84 19,821 3.98 308.15 20,058 313.15 4.12 20,295 The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat- SOURCE AND PURITY OF MATERIALS: urated with the gas as it flows through 1. Neon. Matheson Co., Inc. Both an 8 mm x 180 cm glass spiral atstandard and research grades tached to a gas buret. The total pressure of solute gas plus solvent were used with no difference in results. vapor pressure is maintained at 1 atm 2. Hexane. Humphrey-Wilkinson, Inc., as the gas is absorbed. New Haven, CN. Shaken with H2SO4, ADDED NOTE. Makranczy, J.; Megyerywashed, dried over sodium, dis-Balog, K.; Rusz, L.; Patyi, L. Hung. J. tilled. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.076 at 298.15 K for this system. The value was not used in the smoothed data fit above. ESTIMATED ERROR: &T/K = 0.05 APPARATUS/PROCEDURE: The apparatus is a  $\delta P/torr = 3$ modification of that of Morrison and  $\delta x_1 / x_1 = 0.03$ Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for **REFERENCES**: a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modi-fication of the method of Baldwin and 1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819. Daniel (2). Baldwin, R.R.; Daniel, S.G. J. <u>Appl. Chem</u>. 1952, <u>2</u>, 161.

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| COMPONENTS:<br>COMPONENTS:<br>1. Neon; Ne; 7440-01-9<br>2. Heptane; $C_{7}H_{16}$ ; 142-82-5<br>VARIABLES:<br>T/K; 287.15 - 311.95<br>T/K Mol Fraction<br>$\frac{1}{287.15}$ , $\frac{1}{3.0}$<br>$\frac{1}{298.15}$ , $\frac{1}{3.48}$<br>$\frac{1}{298.15}$ , $\frac{1}{3.48}$<br>$\frac{1}{5.29}$<br>$\frac{1}{5.15}$ , $\frac{1}{5.29}$<br>$\frac{1}{5.15}$<br>$\frac{1}{3.10}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.48}$<br>$\frac{1}{5.29}$<br>$\frac{1}{5.71}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.48}$<br>$\frac{1}{5.29}$<br>$\frac{1}{5.71}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.48}$<br>$\frac{1}{5.29}$<br>$\frac{1}{5.71}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.48}$<br>$\frac{1}{5.29}$<br>$\frac{1}{5.71}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{283.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{29.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{29.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{30.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{30.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{30.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{30.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{19.25}$<br>$\frac{1}{30.15}$ , $\frac{1}{3.29}$<br>$\frac{1}{20.325}$<br>$\frac{1}{31.15}$ , $\frac{1}{3.96}$<br>$\frac{1}{20.399}$<br>The solubility values were adjusted to a partial pressure of neon of 101.25 kPa (1 am) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>MOTIONO Volumetric. The solvent is sat-<br>Source AND FURITY OF MATEMALS:<br>1. Neon. Matheson Co., Inc. Both standard and research grades were used.<br>$\frac{1}{20.5}$<br>$\frac{1}{20.5}$ $\frac{1}{20.5}$ $\frac{1}{20.5}$<br>$\frac{1}{20.5}$ $\frac{1}{20.5}$ $\frac{1}{20.5}$ $\frac{1}{20.15}$<br>$\frac{1}{20.5}$ $\frac{1}{20.5}$ $\frac{1}{20.15}$<br>$\frac{1}{20.7}$ $\frac{1}{20.25}$ $\frac{1}{20.15}$<br>$\frac{1}{20.7}$ $\frac{1}{20.9}$ $\frac{1}{20.25}$ $\frac{1}{20.15}$<br>$\frac{1}{20.7}$ $\frac{1}{20.25}$ $\frac{1}{20.15}$<br>$\frac{1}{20.7}$ $\frac{1}{20.25}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$ $\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$<br>$\frac{1}{20.15}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                      | I                                                                                                                               |  |  |
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| 1. Neon; He; 7440-01-9       Clever, H. L.; Battino, R.;         2. Neptane; $C_{7}B_{16}$ ; 142-62-5       J. Phys. Chem. 1957, 61, 1078 - 1083.         VARIABLES:<br>T/K: 287.15 - 311.95       J. Phys. Chem. 1957, 61, 1078 - 1083.         PKPRNETAL VALUES:       Bunnen         T/K: 101.325 (1 atm)       Bunnen         Coefficient       Coefficient         287.15       3.30         296.15       3.48         297.15       3.30         298.15       3.48         298.15       3.48         311.95       3.96         311.95       3.96         298.15       3.15         298.15       3.15         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29         298.15       3.29                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | COMPONENTS:                                                                                                                                                          | ORIGINAL MEASUREMENTS:                                                                                                          |  |  |
| 2. Heptane; $C_{1}H_{16}$ ; 142-82-5<br>J. Phys. Chem. 1957, <u>61</u> , 1078 - 1083.<br>VARIABLES:<br>T/K: 287.15 - 311.95<br>P/KPai: 101.325 (1 atm)<br>EXPERIMENTAL VALUES:<br>T/K Mol Fraction<br>298.15 3.48<br>298.15 3.48<br>5.29 5.77<br>311.95 3.96<br>5.92 6.76<br>Smoothed Data: $\Delta G^{\circ}/J$ mol <sup>-1</sup> = - RT In X <sub>1</sub> = 5,571.9 + 47.347 T<br>Std. Dev. $\Delta G$ = 45.0, Coef. Corr. = 0.9971<br>$\Delta H^{\circ}/J$ mol <sup>-1</sup> = 5,571.9, $\Delta S^{\circ}/J$ K <sup>-1</sup> mol <sup>-1</sup> = -47.347<br>T/X Mol Fraction<br>$\Delta G^{\circ}/J$ mol <sup>-1</sup> = -47.347<br>T/X Mol Praction<br>$\Delta H^{\circ}/J$ mol <sup>-1</sup> = 5,571.9, $\Delta S^{\circ}/J$ K <sup>-1</sup> mol <sup>-1</sup><br>208.15 3.22<br>203.15 3.45<br>308.15 3.22<br>203.15 3.45<br>308.15 3.22<br>203.15 3.45<br>308.15 3.22<br>203.15 3.45<br>308.15 3.22<br>203.15 3.45<br>308.15 3.29<br>The solubility values were adjusted to a partial pressure of neon of<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>MUXILIAN INFORMATION<br>METHOD: volumetric. The solvent is sat-<br>grad with the gas as it flows<br>turated withe gas as it flows<br>turated with the gas as it flows<br>tur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1. Neon; Ne; 7440-01-9                                                                                                                                               | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.                                                                      |  |  |
| VARIABLES:<br>T/K: 287.15 - 311.95<br>P/KPa: 101.325 (1 atm)       PHYS. Chem. 1957, 61, 1078 - 1083.         EXPERIMENTAL VALUES:<br>T/K Mol Fraction<br>287.15 - 3.10<br>287.15 - 3.48<br>287.15 - 3.15<br>18,978<br>283.15 - 3.29<br>19,215<br>293.15 - 3.42<br>29,15 - 3.55<br>303.15 - 3.69<br>20,399<br>The solubility values were adjusted to a partial pressure of neon of<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>AUXILLARY INFORMATION          METHOD: Volumetric. The solvent is sat-<br>brossure of ficient of 0.069 az 29.118<br>Auxiliant was need at 1 tam<br>as the gas is absorbed.<br>ADDED NOTE. Makranczy, J., Megyery-<br>Balog, K, Kusz, L. 1/261 yr. L. Mung, J-<br>Ind. Chem. 1976, 4, 269 report an<br>Billet(1). The modifications in-<br>cuded the addition of tat fit above.<br>APPAMUS/PROCEDUBE: The apparatus is a<br>modification of that of Morrison and<br>Billet(1). The modifications in-<br>cude the addition of a spiral tabore.<br>APPAMUS/PROCEDUBE: The apparatus is a<br>modification of the method of Baldwin and<br>Billet(1). The modifications in-<br>cude the addition of a spiral tabore.<br>The solvent is degassed by a modific-<br>thid. 1952, 29, 181.<br>Auxing Procenem. 1952, 2, 161.<br>Appl. Chem. 195                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2. Heptane; C <sub>7</sub> H <sub>16</sub> ; 142-82-5                                                                                                                |                                                                                                                                 |  |  |
| VARIABLES:<br>T/K: 287.15 - 311.95<br>P/KPa: 101.325 (1 atm)<br>EXPERIMENTAL VALUES:<br>T/K MOI Fraction<br>288.15 3.48<br>298.15 3.48<br>5.29 5.77<br>311.95 3.96<br>Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = 5,571.9 + 47.347 T$<br>Std. Dev. $\Delta G = 45.0$ , Ceef. Corr. = 0.9971<br>$\Delta H^{\circ}/J \mod^{-1} = 5,571.9$ , $\Delta S^{\circ}/J K^{-1} \mod^{-1} = -47.347$<br>T/K Mol Fraction<br>$\Delta G^{\circ}/J \mod^{-1} = -5,571.9$ , $\Delta S^{\circ}/J K^{-1} \mod^{-1} = -47.347$<br>$\overline{T/K}$ Mol Fraction<br>$\Delta G^{\circ}/J \mod^{-1} = -47.347$<br>T/K Mol Fraction<br>$\Delta G^{\circ}/J \mod^{-1} = -47.347$<br>$\Delta G^{\circ}/J \mod^{-1} = -47.347$<br>T/K Mol Fraction<br>$\Delta G^{\circ}/J \mod^{-1} = -47.347$<br>$\Delta G^{\circ}/J$                                                                                                                                                                                                                                                                                                                                                                                                                                                         | , 10                                                                                                                                                                 | <u>J. Phys</u> . <u>Chem</u> . 1957, <u>61</u> , 1078 - 1083.                                                                   |  |  |
| T/K: 287.15 - 311.95<br>P/kPa: 101.325 (1 atm)<br>EXTERIMENTAL VALUES:<br>T/K MOI Fraction<br>280.15<br>280.15<br>280.15<br>3.48<br>5.29<br>5.29<br>5.77<br>311.95<br>3.96<br>5.29<br>5.77<br>311.95<br>Smoothed Data: $\Delta G^{\circ}/J \ mol^{-1} = - RT \ ln X_1 = 5,571.9 + 47.347 \ T$<br>Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971<br>$\Delta H^{\circ}/J \ mol^{-1} = 5,571.9 , \Delta S^{\circ}/J \ K^{-1} \ mol^{-1} = -47.347$<br>T/K Mol Fraction $\Delta G^{\circ}/J \ mol^{-1}$<br>283.15<br>3.15<br>293.15<br>3.15<br>293.15<br>3.69<br>19,925<br>293.15<br>3.69<br>19,925<br>203.15<br>3.69<br>19,925<br>203.15<br>3.96<br>20,399<br>The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>AUXILIARY INFORMATION<br>NETMOU' Volumetric. The solvent is sat-<br>through an 8 mm x 180 cm glass spiral transformed and research grades were used.<br>2. Heptane. Phillips Petroleum Co. Bartlesville, OK. Used as received.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VARIABLES:                                                                                                                                                           | PREPARED BY:                                                                                                                    |  |  |
| EXPERIMENTAL VALUES:<br>$T/K M01 Fraction  287.15 3.30 5.09 5.31  298.15 3.48 5.29 5.77  311.95 3.96 5.92 6.76  Smoothed Data: \Delta G^o/J mol^{-1} = - RT ln X_1 = 5,571.9 + 47.347 T Std. Dev. \Delta G = 45.0, Coef. Corr. = 0.9971\Delta H^o/J mol^{-1} = 5,571.9, \Delta S^o/J K^{-1} mol^{-1} = -47.347 T/K M01 Fraction \Delta G^o/J mol^{-1}298.15 3.42 19,452298.15 3.42 19,452298.15 3.42 19,452298.15 3.42 19,452298.15 3.42 19,452298.15 3.42 20,162313.15 3.96 20,162313.15 3.96 20,162313.15 3.96 20,162313.15 3.96 20,162313.15 3.96 20,162313.15 3.96 20,399The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.The Bunsen coefficients were calculated by the compiler.MUTHOD: volumetric. The solvent is sat-for the gas put solvent is sat-MDED NOTE. Makranczy, J.; Megyery-Ind. Chem. 1976, 4, 269 report anGiswald Coefficient 0.069 at 298.11Northol system. The value was notas the gas is absorbed.ADDED NOTE. Makranczy, J.; Megyery-Ind. Chem. 1976, 4, 269 report anGiswald Coefficient 0.069 at 298.11Northol system. The value was notstand as is degased by a modifi-dification of that of Morrison andGiswald Coefficient 0.069 at 298.15North is system. The value was notREFERENCES:The solvent is degassed by a modifi-dified tion of a spiral stor-carsant reference pressure, and and rescent for hilly Soluble gases.The solvent is degassed by a modifi-dianiel (2).The modification of Baldwin andDaniel (2).The Morrison R. A., paniel, S. G.J. Appl. Chem. 1952, 2, 161.$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | T/K: 287.15 - 311.95<br>P/kPa: 101.325 (1 atm)                                                                                                                       | P. L. Long                                                                                                                      |  |  |
| $\frac{7/K  Mol \ Fraction}{287.15} \frac{x_1 \times 10^4}{3.30} \frac{5.09}{5.92} \frac{5.77}{5.35} \frac{1}{5.35} \frac{1}{298.15} \frac{3.48}{3.48} \frac{5.29}{5.92} \frac{5.77}{6.76}$ Smoothed Data: $\Delta G^\circ/J \ mol^{-1} = - RT \ ln \ X_1 = 5,571.9 + 47.347 \ T$ Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971 $\Delta H^\circ/J \ mol^{-1} = 5,571.9, \ \Delta S^\circ/J \ K^{-1} \ mol^{-1} = -47.347$ $\frac{X_1 \times 10^4}{283.15} \frac{X_1 \times 10^4}{3.15} \frac{18,978}{19,215} \frac{19,952}{293.15} \frac{3.42}{31.15} \frac{16}{3.69} \frac{19,925}{19,255} \frac{306.15}{306.15} \frac{3.82}{306.15} \frac{20,399}{31.51} \frac{19,925}{306.15} \frac{3.62}{303.25} \frac{20,399}{31.51} \frac{11}{3.96} 1000000000000000000000000000000000000$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | EXPERIMENTAL VALUES:                                                                                                                                                 | 1                                                                                                                               |  |  |
| $\frac{x_1 \times 10^4}{287.15} \frac{x_1 \times 10^4}{3.30} \frac{x \times 10^2}{5.09} \frac{L \times 10^2}{5.35}$ $\frac{298.15}{3.165} \frac{3.48}{3.96} \frac{5.29}{5.92} \frac{5.77}{5.77}$ Smoothed Data: $\Delta^{c^0}/J \mod^{-1} = -RT \ln X_1 = 5,571.9 + 47.347 T$ Sd. bev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971 $\Delta H^o/J \mod^{-1} = 5,571.9, \Delta S^o/J K^{-1} \mod^{-1} = -47.347$ $\frac{T/K}{283.15} \frac{3.16}{3.15} \frac{16.978}{19,215} \frac{10.325}{293.15} \frac{3.42}{313.15} \frac{19,215}{3.96} \frac{20.362}{20.399}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. $\frac{AVILLARY INFORMATION}{KITMOY Volumetric. The solvent is sattatached to 1 agas in thiose through an 8 mm x 180 cm glass spiral tatached to a gas buret. The total pressure of solute gas plus solvent as the gas is absorbed. ADDED NOTE. Makranczy, J.; Negyery-Balog, K.; Rusz, L.; Patyi, L. Rung. J.; Ind. Chem. 1976, 4, 269 report an of stat of 0.069 at 2292.15 APAMINS/FROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storger for solvent is degassed by a modification at the solvent is degassed by a modification at lama and laniel (2).$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | T/K Mol Fraction                                                                                                                                                     | Bunsen Ostwald                                                                                                                  |  |  |
| $\frac{287,15}{311.95} 3.30}{3.16} 5.09} 5.35}{3.57}{311.95} 3.96$ Smoothed Data: $\Delta G^{\circ}/J \ mol^{-1} = - RT \ ln \ X_1 = 5,571.9 + 47.347 \ T$ Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971 $\Delta H^{\circ}/J \ mol^{-1} = 5,571.9, \ \Delta S^{\circ}/J \ K^{-1} \ mol^{-1} = -47.347$ $\frac{T/K}{283.15} \ \frac{MO}{3.15} \ \frac{18,978}{19,452}$ 293.15 3.42 19,452 293.15 3.55 19,688 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 303.15 3.69 19,925 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,162 308.15 3.82 20,16 308.15 3.82 20,16 308.15 3.82 20,16 308.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $x_1 \times 10^4$                                                                                                                                                    | $\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \\ \hline \end{array}$ |  |  |
| $\frac{298.15}{31.95} \frac{3.48}{3.96} \frac{5.29}{6.76} \frac{5.77}{6}$ Smoothed Data: $\Delta G^{\circ}/J \ mol^{-1} = -RT \ ln \ X_1 = 5,571.9 + 47.347 \ T$ Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971 $\Delta H^{\circ}/J \ mol^{-1} = 5,571.9, \ \Delta S^{\circ}/J \ mol^{-1} = -47.347$ $\frac{T/K}{283.15} \frac{\Lambda G^{\circ}/J \ mol^{-1}}{3.15} \frac{\Lambda G^{\circ}/J \ mol^{-1}}{18,978}$ $\frac{298.15}{293.15} \frac{3.42}{3.42} \frac{19,425}{19,425}$ $\frac{298.15}{308.15} \frac{3.69}{3.69} \frac{19,925}{20,399}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. $\frac{AUXILIARY \ INFORMATION}{METHOD: Volumetric. The solvent is sattrached to a gas buret. The total attached to a figure as parts solvent is sattracy for this system. The value was not used in the smoothed data fit above. KTRAMINS/FROCEDURE: The apparatus is a modification of a birth of Morrison and Billett(1). The modifications in-action of the method of Baldwin and Daniel (2).$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 287.15 3.30                                                                                                                                                          | 5.09 5.35                                                                                                                       |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \ mol^{-1} = -RT \ ln \ X_1 = 5,571.9 + 47.347 \ T$<br>Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971<br>$\Delta H^{\circ}/J \ mol^{-1} = 5,571.9$ , $\Delta S^{\circ}/J \ K^{-1} \ mol^{-1} = -47.347$<br>$T/K$ Mol Fraction $\Delta G^{\circ}/J \ mol^{-1}$<br>$X_1 \ x \ 10^4$<br>$233.15 \ 3.29 \ 19,215$<br>$293.15 \ 3.42 \ 19,452$<br>$298.15 \ 3.29 \ 19,215$<br>$298.15 \ 3.29 \ 19,215$<br>$303.15 \ 3.69 \ 15,925$<br>$303.15 \ 3.69 \ 10,925$<br>$303.15 \ 3.69 \ 20,399$<br>The solubility values were adjusted to a partial pressure of neon of<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>MXILIARY INFORMATION<br>METHOD: Volumetric. The solvent is sat-<br>urated with the gas as if flows<br>through an $8 \ mx \ X100 \ maintained at 1 atm as the gas is absorbed. ADDED NOTE. Makranczy, J. ; Megyery- Balog, K.;Rusz, L.;Patyi, L. Hung, J. Ind. Chem. 1976, 4, 269 report an Giffunction of that of Morrison and Billett(1). The modifications in- clude the addition of a spiral stor- a constant reference pressure, and and Billett(1). The modifications in- clude the addition of a spiral stor- a constant reference pressure, and and Billett(2). REFERENCES: 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1946, 2033; This olvent is degassed by a modifi- ation of the method of Baldwin and Daniel (2).$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 298.15 3.48<br>311.95 3.96                                                                                                                                           | 5.29 5.77<br>5.92 6.76                                                                                                          |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln \chi_1 = 5,5/1.9 + 4/.347 T$<br>Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971<br>$\Delta H^{\circ}/J \mod^{-1} = 5,571.9$ , $\Delta S^{\circ}/J K^{-1} \mod^{-1} = -47.347$<br>$\overline{\frac{X_1 \times 10^4}{283.15}}$ , $\overline{\frac{X_1 \times 10^4}{283.15}}$ , $\overline{\frac{X_1 \times 10^4}{298.15}}$ , $\Delta S^{\circ}/J \mod^{-1}$<br>293.15, $3.15$ , $19,688303.15$ , $3.69$ , $19,925306.15$ , $3.69$ , $19,925306.15$ , $3.96$ , $20,399The solubility values were adjusted to a partial pressure of neon of101.325  kPa$ (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>AUXILIARY INFORMATION<br>METHOD: volumetric. The solvent is sat-<br>urated with the gas as it flows<br>METHOD: volumetric. The solvent is sat-<br>gressure of solute gas plus solvent<br>vapor pressure is maintained at 1 atm<br>as the gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. Hung, J.<br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.069 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/FROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a extra buret for highly soluble gases.<br>The solvent is degased by a modifi-<br>Dation of the method of Baldwin and<br>Daniel (2).<br>REFERENCES:<br>Merenences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:<br>Merences:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                      |                                                                                                                                 |  |  |
| Std. Dev. $\Delta G = 45.0$ , Coef. Corr. = 0.9971<br>$\Delta H^{\circ}/J \text{ mol}^{-1} = 5,571.9, \Delta S^{\circ}/J \text{ mol}^{-1} = -47.347$ $\overline{X_1 \times 10^4}$ $\overline{X_1 \times 10^4}$ $\overline{X_1 \times 10^4}$ $\overline{AG^{\circ}/J \text{ mol}^{-1}}$ $\overline{AG^{\circ}/J \text{ mol}$ | Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$                                                                                                              | $X_1 = 5,571.9 + 47.347 \text{ T}$                                                                                              |  |  |
| $\Delta H^{\circ}/J \mod^{-1} = 5,571.9,  \Delta S^{\circ}/J \pmod{-1} = -47.347$ $\frac{1}{2K3.15} \xrightarrow{X_1 \times 104} \Delta G^{\circ}/J \mod^{-1} = -47.347$ $\frac{X_1 \times 104}{283.15} \xrightarrow{X_1 \times 104} \Delta G^{\circ}/J \mod^{-1} = -47.347$ $\frac{X_1 \times 104}{283.15} \xrightarrow{X_1 \times 104} \Delta G^{\circ}/J \mod^{-1} = -47.347$ $\frac{X_1 \times 104}{283.15} \xrightarrow{X_1 \times 104} B_{0},978$ $\frac{X_1 \times 104}{293.15} \xrightarrow{X_2 \times 10} B_{0},215$ $\frac{Y_1 \times 104}{303.15} \xrightarrow{X_2 \times 10} B_{0},925$ $\frac{Y_1 \times 104}{313.15} \xrightarrow{Y_2 \times 10} B_{0},955$ $Y_$                                                                  | Std. Dev. $\Delta G = 45.0$ ,                                                                                                                                        | Coef. Corr. = 0.9971                                                                                                            |  |  |
| $\frac{T/K}{283.15} \frac{Mol Fraction}{3.15} \frac{\Delta G^{\circ}/J \text{ mol}^{-1}}{18,978}$ $\frac{X_1 \times 10^4}{283.15} \frac{3.15}{3.29} \frac{19,215}{19,688}$ $\frac{303.15}{308.15} \frac{3.69}{3.09} \frac{19,925}{20,399}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.<br>$\frac{AUXILIARY \text{ INFORMATION}}{101.325 \text{ kPa} (1 atm) \text{ by Henry's law.}}$ The Bunsen coefficients were calculated by the compiler.<br>$\frac{AUXILIARY \text{ INFORMATION}}{1.8 \text{ mon} \times 180 \text{ cm} \text{ glass spiral}  attached to a gas buret. The total gressure is maintained at 1 atm as the gas is absorbed. ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung, J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.069 at 298.15 K for this system. The value was not used in the smoothed data fit above a constant reference pressure, and an extra buret for highly soluble gases. The solvent is dagased by a modification of the modifications in-clude the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,571.9$                                                                                                                      | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -47.347$                                                                                  |  |  |
| $\begin{array}{c} 283.15 & 3.15 & 18,978 \\ 288.15 & 3.29 & 19,215 \\ 293.15 & 3.42 & 19,452 \\ 298.15 & 3.55 & 19,668 \\ 303.15 & 3.69 & 20,399 \\ \hline \\ 308.15 & 3.82 & 20,162 \\ 313.15 & 3.96 & 20,399 \\ \hline \\ 313.15 & 3.96 & 20,399 \\ \hline \\ \end{array}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. $\begin{array}{c} \\ \hline \\ $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | T/K Mol Fract<br>X_X 10                                                                                                                                              | $\Delta G^{\circ}/J \text{ mol}^{-1}$                                                                                           |  |  |
| $\begin{array}{c} 288.15 & 3.29 & 19,215 \\ 293.15 & 3.42 & 19,452 \\ 298.15 & 3.55 & 19,688 \\ 303.15 & 3.69 & 19,925 \\ 308.15 & 3.82 & 20,162 \\ 313.15 & 3.96 & 20,399 \end{array}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. $\begin{array}{c} \text{AUXILIARY INFORMATION} \end{array}$ $\begin{array}{c} \text{METHOD: Volumetric. The solvent is sather of solute gas burst. The total attached to a gas burst. The total as the gas is absorbed. \\ \text{ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an emotification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). \\ \begin{array}{c} 288.15 & 3.52 & 19,452 \\ 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 & 20,399 &$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 283.15 3.15                                                                                                                                                          | 18,978                                                                                                                          |  |  |
| $\begin{array}{c} 293.15 & 3.52 & 19,688 \\ 303.15 & 3.69 & 19,925 \\ 308.15 & 3.82 & 20,162 \\ 313.15 & 3.96 & 20,399 \end{array}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. $\begin{array}{c} \text{AUXILIARY INFORMATION} \end{array}$ $\begin{array}{c} \text{METHOD: Volumetric. The solvent is sather of a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed. \\ \text{ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Paryi, L. Hung, J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.069 at 298.15 \\ \text{K for this system. The value was not used in the smoothed data fit above.} \\ \begin{array}{c} \text{APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent is degassed by a modification of the method of Baldwin and Daniel (2). \\ \end{array}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                      | 19,215                                                                                                                          |  |  |
| $\begin{array}{c} 303.15 & 3.69 & 19,925 \\ 308.15 & 3.82 & 20,162 \\ 313.15 & 3.96 & 20,399 \\ \hline\end{array}$ The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. $\begin{array}{c} & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 293.15 3.42<br>298.15 3.55                                                                                                                                           | 19,452                                                                                                                          |  |  |
| 308.153.8220,162313.153.9620,399The solubility values were adjusted to a partial pressure of neon of101.325 kPa (1 atm) by Henry's law.The Bunsen coefficients were calculated by the compiler.AUXILIARY INFORMATIONMETHOD: Volumetric. The solvent is sat-<br>trough an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 atm<br>as the gas is absorbed.ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. Hung. J.<br>Ind. Chem. 1976, 4, 269 report an<br>OStwald Coefficient of 0.069 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.AFPARATUS/FROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>Daniel (2).REFERENCES:<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and<br>Daniel (2).References:<br>2. Baldwin, R. R.; Daniel, S. G.<br>J. Appl. Chem. 1952, 2, 161.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 303.15 3.69                                                                                                                                                          | 19,925                                                                                                                          |  |  |
| The solubility values were adjusted to a partial pressure of neon of101.325 kPa (1 atm) by Henry's law.The solubility values were adjusted to a partial pressure of ficients were calculated by the compiler.AUXILIARY INFORMATIONMETHOD: Volumetric. The solvent is saturated with the gas as it flowsAUXILIARY INFORMATIONMETHOD: Volumetric. The solvent is saturated with the gas as it flowsAUXILIARY INFORMATIONMETHOD: Volumetric. The solvent is maintained at 1 atm<br>as the gas is absorbed.ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. Hung. J.<br>Ind. Chem. 1976, 4, 269 report an<br>OStwald Coefficient of 0.069 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.Source AND PURITY OF MATERIALS:1. Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. Hung. J.<br>OStwald Coefficient of 0.069 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.APPARATIS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and<br>Daniel (2).ESTIMATED ERROR:2. Baldwin, R. R.; Daniel, S. G.<br>J. Appl. Chem. 1952, 2, 161.2. Baldwin, R. R.; Daniel, S. G.<br>J. Appl. Chem. 1952, 2, 161.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 308.15 3.82<br>313.15 3.96                                                                                                                                           | 20,162                                                                                                                          |  |  |
| <pre>AUXILIARY INFORMATION<br/>METHOD: Volumetric. The solvent is sat-<br/>urated with the gas as it flows<br/>through an 8 mm x 180 cm glass spiral<br/>attached to a gas buret. The total<br/>pressure of solute gas plus solvent<br/>vapor pressure is maintained at 1 atm<br/>as the gas is absorbed.<br/>ADDED NOTE. Makranczy, J.; Megyery-<br/>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u>, J.<br/>Ind. Chem. 1976, 4, 269 report an<br/>Ostwald coefficient of 0.069 at 298.15<br/>K for this system. The value was not<br/>used in the smoothed data fit above.<br/>APPARATUS/PROCEDURE: The apparatus is a<br/>modification of that of Morrison and<br/>Billett(1). The modifications in-<br/>clude the addition of a spiral stor-<br/>age for the solvent, a manometer for<br/>a constant reference pressure, and an<br/>extra buret for highly soluble gases.<br/>The solvent is degassed by a modifi-<br/>cation of the method of Baldwin and<br/>Daniel (2).<br/>AUXILIARY INFORMATION<br/>METHOD: Source AND PURITY OF MATERIALS:<br/>I. Morrison, T. J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033;<br/><u>ibid</u>.1952, 3819.<br/>2. Baldwin, R. R.; Daniel, S. G.<br/><u>J. Appl</u>. Chem. 1952, <u>2</u>, 161.</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler. |                                                                                                                                 |  |  |
| <ul> <li>METHOD: Volumetric. The solvent is saturated with the gas as it flows</li> <li>urated with the gas as it flows</li> <li>through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.</li> <li>ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald Coefficient of 0.069 at 298.15 K for this system. The value was not used in the smoothed data fit above.</li> <li>APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degased by a modification of the method of Baldwin and Daniel (2).</li> <li>Surce AND PURITY OF MATERIALS:</li> <li>Neon. Matheson Co., Inc. Both standard and research grades were used.</li> <li>Heptane. Phillips Petroleum Co. Bartlesville, OK. Used as received.</li> <li>Heptane. Phillips Petroleum Co. Bartlesville, OK. Used as received.</li> <li>ESTIMATED ERROR:</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | AUXILIARY                                                                                                                                                            | INFORMATION                                                                                                                     |  |  |
| <ul> <li>urated with the gas as it flows</li> <li>through an 8 mm x 180 cm glass spiral<br/>attached to a gas buret. The total<br/>pressure of solute gas plus solvent<br/>vapor pressure is maintained at 1 atm<br/>as the gas is absorbed.</li> <li>ADDED NOTE. Makranczy, J.; Megyery-<br/>Balog, K.;Rusz, L.;Patyi, L. Hung, J.<br/>Ind. Chem. 1976, 4, 269 report an<br/>Ostwald coefficient of 0.069 at 298.15<br/>K for this system. The value was not<br/>used in the smoothed data fit above.</li> <li>APPARATUS/PROCEDURE: The apparatus is a<br/>modification of that of Morrison and<br/>Billett(1). The modifications in-<br/>clude the addition of a spiral stor-<br/>age for the solvent, a manometer for<br/>a constant reference pressure, and an<br/>extra buret for highly soluble gases.<br/>The solvent is degased by a modifi-<br/>cation of the method of Baldwin and<br/>Daniel (2).</li> <li>Neon. Matheson Co., Inc. Both<br/>standard and research grades were<br/>used.</li> <li>Heptane. Phillips Petroleum Co.<br/>Bartlesville, OK. Used as<br/>received.</li> <li>ESTIMATED ERROR:</li> <li>ESTIMATED ERROR:</li> <li>BEFERENCES:</li> <li>Morrison, T. J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033;<br/>ibid.1952, 3819.</li> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. Appl. Chem. 1952, 2, 161.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | METHOD: Volumetric. The solvent is sat-                                                                                                                              | SOURCE AND PURITY OF MATERIALS:                                                                                                 |  |  |
| <ul> <li>vapor pressure is maintained at 1 atm as the gas is absorbed.</li> <li>ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung. J.<br/>Ind. Chem. 1976, <u>4</u>, 269 report an Ostwald coefficient of 0.069 at 298.15<br/>K for this system. The value was not used in the smoothed data fit above.</li> <li>APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).</li> <li>Kappan. Law and the method of Baldwin and Daniel (2).</li> <li>Heptane. Phillips Petroleum Co. Bartlesville, OK. Used as received.</li> <li>Bartlesville, OK. Used as received.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | urated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent                | <ol> <li>Neon. Matheson Co., Inc. Both<br/>standard and research grades were<br/>used.</li> </ol>                               |  |  |
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| $\begin{array}{c} \hline \text{Ostwald coefficient of 0.069 at 298.15} \\ \text{K for this system. The value was not} \\ \text{used in the smoothed data fit above.} \\ \hline \text{APPARATUS/PROCEDURE: The apparatus is a} \\ \text{modification of that of Morrison and} \\ \text{Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). \\ \hline \end{tabular} \begin{array}{l} \text{ESTIMATED ERROR:} \\ \text{ESTIMATED ERROR:} \\ \text{ESTIMATED ERROR:} \\ \text{Contexponent of the solvent of the solvent of the solvent of the method of Baldwin and Daniel (2).} \\ \hline \end{tabular} \begin{array}{l} \text{ESTIMATED ERROR:} \\ \text{ESTIMATED ERROR:} \\ \text{ESTIMATED ERROR:} \\ \text{ESTIMATED ERROR:} \\ \text{Contexponent of the solvent of the solvent of the solvent of the method of Baldwin and Daniel (2).} \\ \hline \end{tabular}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br>Ind. Chem. 1976. 4. 269 report an                                            | received.                                                                                                                       |  |  |
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| $\begin{array}{llllllllllllllllllllllllllllllllllll$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ADDADATHS (DDOCENHER, mbs secondary is a                                                                                                                             | ESTIMATED ERROR:                                                                                                                |  |  |
| age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and<br>Daniel (2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-                                                    | $\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$                                                           |  |  |
| <ul> <li>a constant reference pressure, and an extra buret for highly soluble gases.</li> <li>The solvent is degassed by a modification of the method of Baldwin and Daniel (2).</li> <li>Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | age for the solvent, a manometer for                                                                                                                                 | REFERENCES:                                                                                                                     |  |  |
| Daniel (2).<br>2. Baldwin, R. R.; Daniel, S. G.<br><u>J. Appl. Chem</u> . 1952, <u>2</u> , 161.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and        | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br>ibid.1952, 3819.                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Daniel (2).                                                                                                                                                          | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl. Chem</u>. 1952, <u>2</u>, 161.</li> </ol>                                |  |  |

| COMPONENTS:                                          | EVALUATOR:                                      |
|------------------------------------------------------|-------------------------------------------------|
| l. Neon; Ne; 7440-01-9                               | H. L. Clever                                    |
| 2. Octane; C <sub>8</sub> H <sub>18</sub> ; 111-65-9 | Emory University<br>Atlanta, GA 30322<br>U.S.A. |
|                                                      | March 1978                                      |

CRITICAL EVALUATION:

The solubility of neon in octane was measured at three laboratories. Clever, Battino, Saylor and Gross (1) report three solubility values between 287.25 and 312.15 K. Makranczy, Megyery-Balog, Rusz, and Patyi (2) and Wilcock, Battino and Danforth (3) each report one solubility value near 298 K.

The solubility value of Makranczy <u>et al</u>. (Ostwald coefficient  $5.7 \times 10^{-2}$  and mole fraction  $3.8 \times 10^{-4}$  at 298.15 K) is not recommended. It was reported to only two significant figures and it is 5.5 percent higher than the values from the other two laboratories.

The solubility values of Clever <u>et al</u>. and Wilcock <u>et al</u>. agree within 0.8 percent at 298.15 K. Without solubility values to compare at several temperatures it is not possible to recommend values of neon in octane solubility except for the mole fraction of  $3.595 \times 10^{-4}$  at 298.15 K and 101.325 kPa. However, we have combined the solubility data of Clever, <u>et al</u>. and Wilcock <u>et al</u>. in a one to one weight least squares fit to a Gibbs energy equation linear in temperature. The result gives a tentative set of solubility data and changes in thermodynamic properties.

The tentative values for the transfer of one mole of neon from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 6,962.8 + 42.524 T$ 

Std. Dev. ∆G° = 27.6, Coef. Corr. = 0.9980

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,962.8, \quad \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -42.524$ 

The tentative solubility values and Gibbs energy as a function of temperature are in Table 1.

TABLE 1. The solubility of neon in octane. Tentative values of the mole fraction solubility at 101.325 kPa and the Gibbs energy change as a function of temperature.

| Т/К    | Mol Fraction<br>X <sub>l</sub> x 10 <sup>4</sup> | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------------------------|-------------------------|
| 288.15 | 3.285                                            | 19,216                  |
| 293.15 | 3.45                                             | 19,429                  |
| 298.15 | 3.62                                             | 19,641                  |
| 303.15 | 3.79                                             | 19,854                  |
| 308.15 | 3.97                                             | 20,067                  |
| 313.15 | 4.14                                             | 20,279                  |

 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, <u>61</u>, 1078.

 Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. <u>Hung</u>. J. Ind. Chem. 1976, 4, 269.

 Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. Chem. Thermodyn. 1978, 10, 817.

| COMPONENTS :                                         |                       | ORIGINAL MEAS                       | UREMENTS:                  |                                                      |
|------------------------------------------------------|-----------------------|-------------------------------------|----------------------------|------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                               |                       | Clever, H.L                         | .; Battino, R.;            |                                                      |
| 2. Octane; C <sub>8</sub> H <sub>18</sub> ; 111-65-9 |                       | Saylor,                             | J.H.; Gross, P.M.          |                                                      |
|                                                      |                       |                                     | J. Phys. Ch                | <u>em</u> . 1957, <u>61</u> , 1078-1083.             |
| VARIABLES:                                           |                       |                                     | PREPARED BY:               |                                                      |
| Т/К:                                                 | 287.25 -              | - 312.15                            |                            | P. L. Long                                           |
| P/kPa:                                               | 101.325               | (1 atm)                             |                            | T.D. Dong                                            |
| EXPERIMENTAL VALUE                                   | ES:                   |                                     |                            |                                                      |
|                                                      | т7к                   | Mol Fraction                        | Bunsen                     | Ostwald                                              |
|                                                      |                       | C                                   | Coefficient                | Coefficient                                          |
|                                                      |                       | $\frac{x_1 \times 10^{-1}}{x_1}$    | α x 10 <sup>-</sup>        | L x 10 <sup>-</sup>                                  |
|                                                      | 287.25                | 3.29                                | 4.56                       | 4.80                                                 |
|                                                      | 298.35                | 3.58<br>4.14                        | 4.91<br>5.58               | 5.36<br>6.38                                         |
| Smoothed Data:                                       | ∆G <sup>O</sup> /J π  | $nol^{-1} = - RT ln$                | $X_{-} = 6947.9$           | + 42.561 T                                           |
|                                                      | 5+d D                 | $\wedge C^0 = 32.5$                 | Coof Corr                  | - 0 9981                                             |
|                                                      | Stu. De               | 20. 20 - 52.5,                      | COEL. COIL.                | - 0.9981                                             |
| The solubility<br>101.325 kPa (1                     | values v<br>atm) bv   | vere adjusted to<br>Henry's law.    | a partial                  | pressure of neon of                                  |
| The Bunsen coet                                      | ficients              | -<br>s were calculate               | d by the co                | mpiler.                                              |
|                                                      |                       |                                     |                            |                                                      |
| For the recommendation for the second                | ended Gib<br>critical | obs energy equat<br>l evaluation of | ion and smo<br>the solubil | othed values of the solu-<br>ity of neon in octane.  |
|                                                      |                       |                                     |                            |                                                      |
|                                                      |                       |                                     |                            |                                                      |
|                                                      |                       |                                     |                            |                                                      |
|                                                      |                       |                                     |                            |                                                      |
| <u> </u>                                             |                       |                                     |                            |                                                      |
|                                                      |                       | AUXILIARY                           | INFORMATION                |                                                      |
| METHOD:                                              | The sol               | vent is satu-                       | SOURCE AND PU              | RITY OF MATERIALS:<br>Matheson Co., Inc. Both        |
| rated with the                                       | gas as i              | it flows through                    | standa                     | rd and research grades were                          |
| to a gas buret.                                      | The to                | spiral accached<br>stal pressure of | result                     | s.                                                   |
| solute gas plus                                      | s solvent<br>at l atm | : vapor pressure<br>as the gas is   | 2. Octane                  | . Humphrev-Wilkinson Inc.                            |
| absorbed.                                            |                       |                                     | Shaken                     | with H <sub>2</sub> SO <sub>4</sub> , washed, dried, |
|                                                      |                       |                                     | distil                     | led.                                                 |
|                                                      |                       |                                     |                            |                                                      |
|                                                      |                       |                                     |                            |                                                      |
| APPARATUS/PROCEDU                                    | RE:                   |                                     | ESTIMATED ERI              | ROR: $\delta T/K = 0.05$                             |
| The apparatu                                         | is is a m             | odification of                      |                            | $\delta P/torr = 3$<br>$\delta x / x = 0.03$         |
| modifications i                                      | nclude t              | he addition of                      |                            |                                                      |
| a spiral storag<br>manometer for a                   | le for th<br>constan  | e solvent, a<br>t reference         | REFERENCES :               |                                                      |
| pressure, and a highly soluble                       | n extra               | buret for<br>The solvent is         | 1. Morriso                 | on, T.J.; Billett, F.                                |
| degassed by a m                                      | odificat              | ion of the                          | ibid.19                    | 52, 3819.                                            |
| metnoa of Baldw                                      | vin and D             | aniei (2).                          | 2. Baldwin                 | n, R.R.; Daniel, S.G.                                |
|                                                      |                       |                                     | J. App.                    | <u>l. Chem</u> . 1952, <u>2</u> , 161.               |

**COMPONENTS:** ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E. 2. Octane; C<sub>2</sub>H<sub>18</sub>; 111-65-9 J. Chem. Thermodyn. 1978, 10, 817-822. VARIABLES: PREPARED BY: T/K: 298.27 A.L. Cramer P/kPa: 101.325 (1 atm) **EXPERIMENTAL VALUES:** T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 298.27 3.609 4.951 5.406 See the evaluation of neon + octane for recommended Gibbs equation and smoothed solubility values. The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD /APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: The apparatus is based on the de-1. Neon. Matheson Co. Inc. sign of Morrison and Billett (1), and the version used is described by Purest commercially available grade. Battino, Evans, and Danforth (2). The degassing apparatus and procedure are 2. Octane. Phillips Petroleum Co. degassing apparatus and proceedie are described by Battino, Banzhof, Bogan, and Wilhelm (3). Degassing. Up to 500 cm<sup>3</sup> of sol-vent is placed in a flask of such size minimum 99 mol per cent. that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N2 trap until the ESTIMATED ERROR: permanent gas residual pressure drops  $\delta T/K = 0.03$  $\delta P/mmHg = 0.5 \\ \delta X_1/X_1 = 0.02$ to 5 microns. Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube con-**REFERENCES:** taining the solute gas plus the sol-1.Morrison, T.J.; Billett, F. vent vapor at a total pressure of one J. Chem. Soc. 1948, 2033. atm. The volume of gas absorbed is found by difference between the ini-2.Battino, R.; Evans, F.D.; Danforth, W.F. J.Am.Oil Chem.Soc. 1968, 45, 830. tial and final volumes in the buret 3. Battino, R.; Banzhof, M.; Bogan, M.; system. The solvent is collected in a Wilhelm, E. tared flask and weighed. <u>Anal</u>. <u>Chem</u>. 1971, <u>43</u>, 806.

| COMPONENTS:                                                                                                                                                          | ORIGINAL MEASUREMENTS:                                                                                                                             |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                               | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.                                                                                         |  |  |
| 2. 3-Methylheptane; C <sub>8</sub> H <sub>18</sub> , 589-81-1                                                                                                        |                                                                                                                                                    |  |  |
|                                                                                                                                                                      | J. Phys. Chem. 1957. 61, 1078 - 1083                                                                                                               |  |  |
|                                                                                                                                                                      | <u> </u>                                                                                                                                           |  |  |
| VARIABLES:                                                                                                                                                           | PREPARED BY:                                                                                                                                       |  |  |
| т/к: 287.15 - 312.15                                                                                                                                                 | P. L. Long                                                                                                                                         |  |  |
| P/kPa: 101.325 (1 atm)                                                                                                                                               |                                                                                                                                                    |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                 |                                                                                                                                                    |  |  |
| T/K Mol Fraction                                                                                                                                                     | Bunsen Ostwald                                                                                                                                     |  |  |
| $x_{1} \times 10^{4}$                                                                                                                                                | $\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \end{array}$                              |  |  |
| 287.15 3.47                                                                                                                                                          | 4.85 5.10                                                                                                                                          |  |  |
| 298.15 3.66                                                                                                                                                          | 5.05 5.51                                                                                                                                          |  |  |
| 312.15 4.18                                                                                                                                                          | 5.66 6.47                                                                                                                                          |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$                                                                                                      | X <sub>1</sub> = 5,652.7 + 46.652 T                                                                                                                |  |  |
| Std. Dev. $\Delta G^{\circ} = 46.3$ ,                                                                                                                                | Coef. Corr. = 0.9969                                                                                                                               |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,652.7$                                                                                                                      | , $\Delta S^{\circ}/J \mod K^{-1} \mod^{-1} = -46.652$                                                                                             |  |  |
| T/K Mol Frac                                                                                                                                                         | tion $\Delta G^{\circ}/J$ mol <sup>-1</sup>                                                                                                        |  |  |
| X1 x 1                                                                                                                                                               | 04                                                                                                                                                 |  |  |
| 283.15 3.31                                                                                                                                                          | 18,862                                                                                                                                             |  |  |
|                                                                                                                                                                      | 19,095                                                                                                                                             |  |  |
| 293.15 5.00                                                                                                                                                          | 19,562                                                                                                                                             |  |  |
| 303.15 3.88                                                                                                                                                          | 19,795                                                                                                                                             |  |  |
| 308.15 4.03                                                                                                                                                          | 20,028                                                                                                                                             |  |  |
| 313.15 4.17                                                                                                                                                          | 20,262                                                                                                                                             |  |  |
| The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler. |                                                                                                                                                    |  |  |
| AUXILIARY                                                                                                                                                            | INFORMATION                                                                                                                                        |  |  |
|                                                                                                                                                                      |                                                                                                                                                    |  |  |
| urated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent                | SOURCE AND PORTIF OF MATERIALS:<br>1. Neon. Matheson Co., Inc. Both<br>standard and research grades<br>were used with no difference in<br>results. |  |  |
| as the gas is absorbed.                                                                                                                                              | 2. 3-Methylheptane. Humphrey-                                                                                                                      |  |  |
|                                                                                                                                                                      | Wilkinson, Inc., New Haven, CN.<br>Shaken with H <sub>2</sub> SO <sub>4</sub> , washed, dried<br>over Na, distilled through a<br>vacuum column.    |  |  |
|                                                                                                                                                                      |                                                                                                                                                    |  |  |
| APPARATUS/PROCEDURE: The apparatus is a                                                                                                                              | ESTIMATED ERROR:                                                                                                                                   |  |  |
| modification of that of Morrison and                                                                                                                                 | $\delta T/K = 0.05$                                                                                                                                |  |  |
| Billett(1). The modifications in-                                                                                                                                    | $\frac{\delta P}{torr} = 3$                                                                                                                        |  |  |
| clude the addition of a spiral stor-                                                                                                                                 |                                                                                                                                                    |  |  |
| age for the solvent, a manometer for                                                                                                                                 | REFERENCES ;                                                                                                                                       |  |  |
| extra buret for highly soluble gases                                                                                                                                 | 1. Morrison, T. J.: Billett. F.                                                                                                                    |  |  |
| The solvent is degassed by a modifi-                                                                                                                                 | J. Chem. Soc. 1948, 2033;                                                                                                                          |  |  |
| cation of the method of Baldwin and                                                                                                                                  | <u>ibid.1952, 38</u> 19.                                                                                                                           |  |  |
| Daniel (2).                                                                                                                                                          | 2 Polduin P. P. Domiol. C. C.                                                                                                                      |  |  |
|                                                                                                                                                                      | <u>J. Appl. Chem</u> . 1952, <u>2</u> , 161.                                                                                                       |  |  |

| COMPONENTS:                                                                                              | ORTGINAL MEASUREMENTS .                                         |  |  |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                   | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.      |  |  |
| 2. 2,3-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ;<br>584-94-1                                      |                                                                 |  |  |
|                                                                                                          | J. Phys. Chem. 1957, 61, 1078 - 1083.                           |  |  |
|                                                                                                          |                                                                 |  |  |
| VARIABLES:                                                                                               | PREPARED BY:                                                    |  |  |
| T/K: 287.15 - 312.15                                                                                     | P. L. Long                                                      |  |  |
| P/kPa: 101.325 (1 atm)                                                                                   |                                                                 |  |  |
| EXPERIMENTAL VALUES.                                                                                     |                                                                 |  |  |
| $x_1 \times 10^4$                                                                                        | Coefficient Coefficient $\alpha \times 10^2$ L x $10^2$         |  |  |
| 287.15 3.28                                                                                              | 4.61 4.85                                                       |  |  |
| 298.15 3.66<br>312.15 4.00                                                                               | 5.09 5.56<br>5.47 6.25                                          |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$                                          | $X_1 = 5,857.7 + 46.243 \text{ T}$                              |  |  |
| Std. Dev. $\Delta G^{\circ} = 26.0$ ,                                                                    | Coef. Corr. = 0.9990                                            |  |  |
| $AH^{\circ}/I = 5.857.7$                                                                                 | $\Delta S^{\circ} / I \kappa^{-1} mol^{-1} = -46.243$           |  |  |
|                                                                                                          | $L_{\rm res} = 10.243$                                          |  |  |
| $X_1 \times 1$                                                                                           | $p_{0}^{2}$                                                     |  |  |
| 283.15 3.19                                                                                              | 18,952                                                          |  |  |
| 288.15 3.33                                                                                              | 19,183                                                          |  |  |
|                                                                                                          | 19,414                                                          |  |  |
| 303.15 3.76                                                                                              | 19,876                                                          |  |  |
| 308.15 3.90                                                                                              | 20,108                                                          |  |  |
| 313.15 4.05                                                                                              | 20,339                                                          |  |  |
| The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. |                                                                 |  |  |
| The Bunsen coefficients were calculated by the compiler.                                                 |                                                                 |  |  |
|                                                                                                          |                                                                 |  |  |
| AUXILIARY                                                                                                | INFORMATION                                                     |  |  |
| METHOD: Volumetric. The solvent is sat- SOURCE AND PURITY OF MATERIALS:                                  |                                                                 |  |  |
| urated with the gas as it flows                                                                          | 1. Neon. Matheson Co., Inc. Both                                |  |  |
| through an 8 mm x 180 cm glass spiral                                                                    | standard and research grades<br>were used with no difference in |  |  |
| attached to a gas buret. The total                                                                       |                                                                 |  |  |
| vapor pressure is maintained at 1 atm                                                                    | results.                                                        |  |  |
| as the gas is absorbed.                                                                                  | 2. 2,3-Dimethylhexane. Humphrey-                                |  |  |
|                                                                                                          | Wilkinson, Inc., New Haven, CT.                                 |  |  |
|                                                                                                          | Shaken with H <sub>2</sub> SO <sub>4</sub> , washed, dried      |  |  |
|                                                                                                          | over Na, distilled through a                                    |  |  |
|                                                                                                          |                                                                 |  |  |
|                                                                                                          |                                                                 |  |  |
|                                                                                                          | ESTIMATED ERROR:                                                |  |  |
| APPARATUS/PROCEDURE: The apparatus is a                                                                  | $\delta T/K = 0.05$                                             |  |  |
| modification of that of Morrison and                                                                     | $\delta P/torr = 3$                                             |  |  |
| clude the addition of a spiral stor-                                                                     | $\delta X_{1}/X_{1} = 0.03$                                     |  |  |
| age for the solvent, a manometer for                                                                     |                                                                 |  |  |
| a constant reference pressure, and an                                                                    | REFERENCES:                                                     |  |  |
| extra buret for highly soluble gases.                                                                    | 1. Morrison, T. J.; Billett, F.                                 |  |  |
| The solvent is degassed by a modifi-                                                                     | J. Cnem. SOC. 1948, 2033;                                       |  |  |
| Daniel (2).                                                                                              | 1010, 1752; 3017.                                               |  |  |
|                                                                                                          | 2. Baldwin, R. R.; Daniel, S. G.                                |  |  |
|                                                                                                          | J. Appl. Chem. 1952, <u>2</u> , 161.                            |  |  |
|                                                                                                          |                                                                 |  |  |

| COMPONENTS:                                                            | ORIGINAL MEASUREMENTS:                                     |  |  |
|------------------------------------------------------------------------|------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                 | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M. |  |  |
| 2. 2,4-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ;<br>589-43-5    |                                                            |  |  |
| 505 45 5                                                               | J. Phys. Chem. 1957, 61, 1078 - 1083.                      |  |  |
|                                                                        |                                                            |  |  |
| VARIABLES                                                              |                                                            |  |  |
| т/к: 287.35 - 312.15                                                   | P. L. Long                                                 |  |  |
| P/kPa: 101.325 (1 atm)                                                 | -                                                          |  |  |
|                                                                        |                                                            |  |  |
|                                                                        |                                                            |  |  |
| EXPERIMENTAL VALUES:                                                   | Bunsen Ostwald                                             |  |  |
|                                                                        | Coefficient Coefficient                                    |  |  |
| $X_{1} \times 10^{4}$                                                  | $\alpha \times 10^2$ L $\times 10^2$                       |  |  |
| <u> </u>                                                               |                                                            |  |  |
| 287.35 3.68                                                            | 5.08 5.34                                                  |  |  |
| 298.15 3.99                                                            | 5.42 5.92                                                  |  |  |
| 312.15 4.39                                                            | 5.89 6.73                                                  |  |  |
|                                                                        |                                                            |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$        | X <sub>1</sub> = 5,303.5 + 47.287 T                        |  |  |
|                                                                        | 0                                                          |  |  |
| Std. Dev. $\Delta G^\circ = 0.6$ ,                                     | Coef. Corr. = 0.9999                                       |  |  |
| Auo/T mal-1 _ 5 202 5                                                  | $\Delta S^{\circ} / I K^{-1} m c l^{-1} = -47 287$         |  |  |
| AR /0 mor = 5,505.5                                                    | - 47.207                                                   |  |  |
|                                                                        |                                                            |  |  |
| T/K Mol Frac                                                           | $\Delta G^{\circ}/J \mod 1$                                |  |  |
|                                                                        | J                                                          |  |  |
| 283.15 3.56                                                            | 18,693                                                     |  |  |
| 288.15 3.70                                                            | 18,929                                                     |  |  |
| 293.15 3.85                                                            | 19,166                                                     |  |  |
| 298.15 3.99                                                            | 19,402                                                     |  |  |
| 303.15 4.13                                                            | 19,638                                                     |  |  |
| 308.15 4.28                                                            | 19,875                                                     |  |  |
| 313.15 4.42                                                            | 20,111                                                     |  |  |
| The solubility values were adjusted to                                 | o a partial pressure of neon of                            |  |  |
| 101.325 kPa (1 atm) by Henry's law.                                    |                                                            |  |  |
| The Bunsen coefficients were calculate                                 | ed by the compiler.                                        |  |  |
|                                                                        |                                                            |  |  |
| AUXILIARY                                                              | INFORMATION                                                |  |  |
| METHOD: Volumetric. The solvent is sat-SOURCE AND PURITY OF MATERIALS: |                                                            |  |  |
| urated with the gas as it flows                                        | 1. Neon. Matheson Co., Inc. Both                           |  |  |
| through an 8 mm x 180 cm glass spiral                                  | standard and research grades                               |  |  |
| attached to a gas buret. The total                                     | were used with no difference in                            |  |  |
| pressure of solute gas plus solvent                                    | results.                                                   |  |  |
| vapor pressure is maintained at 1 atm                                  |                                                            |  |  |
| as the gas is absorbed.                                                | 2. 2,4-Dimethylhexane. Humphrey-                           |  |  |
|                                                                        | Wilkinson, Inc., New Haven, CT.                            |  |  |
|                                                                        | Shaken with H <sub>2</sub> SO <sub>4</sub> , washed, dried |  |  |
|                                                                        | over Na, distilled through a                               |  |  |
|                                                                        | vacuum column.                                             |  |  |
|                                                                        |                                                            |  |  |
|                                                                        |                                                            |  |  |
| APPARATUS/PROCEDURE: The apparatus is a                                | ESTIMATED ERROR: $\delta T/K = 0.05$                       |  |  |
| modification of that of Morrison and                                   | $\delta P/torr = 3$                                        |  |  |
| Billett(1). The modifications in-                                      | $\delta X_1 / X_1 = 0.03$                                  |  |  |
| clude the addition of a spiral stor-                                   |                                                            |  |  |
| age for the solvent, a manometer for                                   |                                                            |  |  |
| a constant reference pressure, and an                                  | REFERENCES:                                                |  |  |
| extra buret for highly soluble gases.                                  | J. Chem. Soc. 1948. 2033.                                  |  |  |
| The solvent is degassed by a modifi-                                   | ibid.1952. 3819.                                           |  |  |
| Cation of the method of Baldwin and Daniel (2)                         |                                                            |  |  |
|                                                                        | 2. Baldwin, R. R.; Daniel, S. G.                           |  |  |
|                                                                        | <u>J. Appl. Chem. 1952, 2, 161.</u>                        |  |  |
|                                                                        |                                                            |  |  |
| 1                                                                      |                                                            |  |  |

| COMPONENTS .                                                                                                                                                                                                                                |                                          | ODTOTIVAL WEAR                                           |                                             |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------|---------------------------------------------|--|
| COMPONENTS:                                                                                                                                                                                                                                 |                                          | ORIGINAL MEASUREMENTS:                                   |                                             |  |
| 1 Neon • Ne• 7440-01-9                                                                                                                                                                                                                      |                                          | Clever, H. L.; Battino, R.;<br>Savlor J. H.; Cross P. M. |                                             |  |
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                      |                                          | Jayror,                                                  | 0, 11, GLOBB, F, M,                         |  |
| 2. 2,2,4-Trimethylpe                                                                                                                                                                                                                        | entane; C <sub>8</sub> H <sub>10</sub> ; |                                                          |                                             |  |
| 540-84-1                                                                                                                                                                                                                                    | 0 10                                     |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          | J. Phys. C                                               | <u>hem</u> . 1957, <u>61</u> , 1078 - 1083. |  |
|                                                                                                                                                                                                                                             |                                          | 1                                                        |                                             |  |
| VARIABLES:                                                                                                                                                                                                                                  |                                          | DDEDADED DV.                                             |                                             |  |
| T/K: 289.30                                                                                                                                                                                                                                 | ) - 312.15                               | I KEI AKED BI                                            | P. L. Long                                  |  |
| P/kPa: 101.32                                                                                                                                                                                                                               | 25 (l atm)                               | ſ                                                        |                                             |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                        |                                          |                                                          | ······································      |  |
| T/K                                                                                                                                                                                                                                         | Mol Fraction                             | Bunsen                                                   | Ostwald                                     |  |
|                                                                                                                                                                                                                                             |                                          | Coefficient                                              | Coefficient                                 |  |
|                                                                                                                                                                                                                                             | x1 x 10.                                 | α x 10 <sup>2</sup>                                      | L X 10-2                                    |  |
| 289.30                                                                                                                                                                                                                                      | 4.32                                     | 5.90                                                     | 6.25                                        |  |
| 298.1                                                                                                                                                                                                                                       | 5 4.61                                   | 6.25                                                     | 6.82                                        |  |
| 312.15                                                                                                                                                                                                                                      | 5 4.96                                   | 6.60                                                     | 7.54                                        |  |
| Smoothed Data: AG°/                                                                                                                                                                                                                         | $I \mod -1 = - RT \ln$                   | $X_1 = 4.489.0$                                          | 0 + 48.864 T                                |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
| Std.                                                                                                                                                                                                                                        | Dev. $\Delta G^{\circ} = 12.7$ ,         | Coef. Cor:                                               | r. = 0.9997                                 |  |
| A 110 /                                                                                                                                                                                                                                     |                                          | ACR /T -1                                                |                                             |  |
| ΔH°/C                                                                                                                                                                                                                                       | mol = 4,489.0                            | , <u>AS°/J</u> K                                         | mol = -48.864                               |  |
| —                                                                                                                                                                                                                                           | T/K Mol Fract                            | tion ∆G°/J                                               | mol <sup>-1</sup>                           |  |
|                                                                                                                                                                                                                                             | $X_1 \times 10^{-10}$                    | <sub>0</sub> 4 <sup></sup> ,-                            |                                             |  |
| -                                                                                                                                                                                                                                           | 283 15 4 16                              | <u> </u>                                                 | 325                                         |  |
|                                                                                                                                                                                                                                             | 288.15 4.30                              | 18,                                                      | 569                                         |  |
|                                                                                                                                                                                                                                             | 293.15 4.44                              | 18,                                                      | 813                                         |  |
| 2                                                                                                                                                                                                                                           | 298.15 4.58                              | 19,0                                                     | 058                                         |  |
|                                                                                                                                                                                                                                             | 303.15 4.72                              | 19,                                                      | 302                                         |  |
|                                                                                                                                                                                                                                             | 308.15 4.86<br>213.15 5.00               | 19,                                                      | 546<br>701                                  |  |
|                                                                                                                                                                                                                                             | 515,15 5.00                              | 17,                                                      |                                             |  |
| The solubility values                                                                                                                                                                                                                       | s were adjusted to                       | o a partial p                                            | pressure of neon of                         |  |
| 101.325 kPa (1 atm) k                                                                                                                                                                                                                       | y Henry's law.                           |                                                          |                                             |  |
| The Purson coefficier                                                                                                                                                                                                                       | ta wara aplaulata                        | d hy the co                                              | milor                                       |  |
| The Builsen Coefficien                                                                                                                                                                                                                      | its were carculate                       | su by the col                                            | wbiter.                                     |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          | INFORMATION                                              |                                             |  |
|                                                                                                                                                                                                                                             | AUXILIARY                                | INFORMATION                                              |                                             |  |
| METHOD: Volumetric. Th                                                                                                                                                                                                                      | e solvent is sat-                        | SOURCE AND PUR                                           | RITY OF MATERIALS:                          |  |
| urated with the gas a                                                                                                                                                                                                                       | as it flows                              | l. Neon.                                                 | Matheson Co., Inc. Both                     |  |
| through an 8 mm x 180                                                                                                                                                                                                                       | ) cm glass spiral                        | standard and research grades                             |                                             |  |
| attached to a gas bur                                                                                                                                                                                                                       | et. The total                            | were used with no difference in                          |                                             |  |
| vanor pressure is mai                                                                                                                                                                                                                       | ntained at 1 atm                         | results                                                  | 5.                                          |  |
| as the gas is absorbe                                                                                                                                                                                                                       | d.                                       | 2. 2.2.4-7                                               | Frimethylpentane, Enjav                     |  |
|                                                                                                                                                                                                                                             |                                          | Co., Ne                                                  | ew York. Used as received.                  |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          | CONTWAMED DDD                                            |                                             |  |
| APPARATUS/PROCEDURE: The                                                                                                                                                                                                                    | apparatus is a                           | ESTIMATED ERRO                                           | $\delta T/K = 0.05$                         |  |
| modification of that                                                                                                                                                                                                                        | of Morrison and                          |                                                          | $\delta P/torr = 3$                         |  |
| Billett(1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi- |                                          |                                                          | $\delta x_1 / x_1 = 0.03$                   |  |
|                                                                                                                                                                                                                                             |                                          |                                                          | -                                           |  |
|                                                                                                                                                                                                                                             |                                          | <b>REFERENCES</b> :                                      |                                             |  |
|                                                                                                                                                                                                                                             |                                          | 1. Morriso                                               | on, T. J.; Billett, F.                      |  |
|                                                                                                                                                                                                                                             |                                          | J. Chen                                                  | n. <u>Soc</u> . 1948, 2033;                 |  |
| cation of the method                                                                                                                                                                                                                        | of Baldwin and                           | ibid 19                                                  | 952, 3819.                                  |  |
| Daniei (2).                                                                                                                                                                                                                                 |                                          | 2. Baldwir                                               | R. R.: Daniel S. G.                         |  |
|                                                                                                                                                                                                                                             |                                          | J. Appl                                                  | . Chem. 1952, 2, 161.                       |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |
|                                                                                                                                                                                                                                             |                                          |                                                          |                                             |  |

| 001/001/01/02                                                                                                 |                                                                                                                                                                         |                                                                                                                                                                            |  |  |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| COMPONENTS:                                                                                                   |                                                                                                                                                                         | ORIGINAL MEASUREMENTS:                                                                                                                                                     |  |  |
| 1. Neon; Ne; 7440-01-9                                                                                        |                                                                                                                                                                         | Clever, H. L.; Battino, R.<br>Saylor, J. H.; Gross, P. M.                                                                                                                  |  |  |
| 2. Nonane; C <sub>9</sub> H <sub>20</sub> ; 111-84-2                                                          |                                                                                                                                                                         |                                                                                                                                                                            |  |  |
|                                                                                                               |                                                                                                                                                                         | <u>J. Phys</u> . <u>Chem</u> . 1957, <u>61</u> , 1078 - 1083.                                                                                                              |  |  |
| VARIABLES:                                                                                                    | 287.15 - 312.15                                                                                                                                                         | PREPARED BY:                                                                                                                                                               |  |  |
| P/kPa:                                                                                                        | L01.325 (1 atm)                                                                                                                                                         | P. L. Long                                                                                                                                                                 |  |  |
|                                                                                                               |                                                                                                                                                                         |                                                                                                                                                                            |  |  |
| EXPERIMENTAL VALUE                                                                                            | S:                                                                                                                                                                      |                                                                                                                                                                            |  |  |
|                                                                                                               | T/K Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup>                                                                                                                    | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$                                                                                               |  |  |
|                                                                                                               | 287.15 3.07                                                                                                                                                             | 3.88 4.08                                                                                                                                                                  |  |  |
|                                                                                                               | 298.15 3.50                                                                                                                                                             | 4.37 4.77                                                                                                                                                                  |  |  |
| -                                                                                                             | 312.15 3.81                                                                                                                                                             | 4.68 5.35                                                                                                                                                                  |  |  |
| Smoothed Data:                                                                                                | $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$                                                                                                                        | $X_1 = 6,336.7 + 45.083 T$                                                                                                                                                 |  |  |
|                                                                                                               | Std. Dev. ∆G° = 45.1,                                                                                                                                                   | Coef. Corr. = 0.9968                                                                                                                                                       |  |  |
|                                                                                                               | $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,336.7$                                                                                                                         | , $\Delta S^{\circ}/J K^{-1} mol^{-1} = -45.083$                                                                                                                           |  |  |
|                                                                                                               | T/K Mol Fract<br>X <sub>l</sub> x 10                                                                                                                                    | tion ΔG°/J mol <sup>-1</sup><br>04                                                                                                                                         |  |  |
|                                                                                                               | 283.15 2.99                                                                                                                                                             | 19,102                                                                                                                                                                     |  |  |
|                                                                                                               | 288.15 3.14                                                                                                                                                             | 19,327                                                                                                                                                                     |  |  |
|                                                                                                               | 298.15 3.43                                                                                                                                                             | 19,778                                                                                                                                                                     |  |  |
|                                                                                                               | 303.15 3.57<br>308.15 3.72                                                                                                                                              | 20,004                                                                                                                                                                     |  |  |
|                                                                                                               | 313.15 3.87                                                                                                                                                             | 20,454                                                                                                                                                                     |  |  |
| The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.      |                                                                                                                                                                         |                                                                                                                                                                            |  |  |
|                                                                                                               |                                                                                                                                                                         |                                                                                                                                                                            |  |  |
|                                                                                                               | AUXILIARY                                                                                                                                                               | INFORMATION                                                                                                                                                                |  |  |
| METHOD: Volumetri                                                                                             | c. The solvent is sat-                                                                                                                                                  | SOURCE AND PURITY OF MATERIALS:                                                                                                                                            |  |  |
| through an 8 m<br>attached to a o<br>pressure of sol<br>vapor pressure<br>as the gas is a                     | a x 180 cm glass spiral<br>gas buret. The total<br>lute gas plus solvent<br>is maintained at 1 atm<br>absorbed.                                                         | <ol> <li>Neon. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used with no difference in<br/>results.</li> <li>Nonane. Phillips Petroleum Co</li> </ol> |  |  |
| ADDED NOTE.Makı<br>Balog, K.;Rusz<br>Ind. Chem. 1976<br>Ostwald coeffic<br>K for this syst<br>used in the smo | canczy, J.; Megyery-<br>, L.;Patyi, L. <u>Hung</u> . J.<br>5, <u>4</u> , 269 report an<br>cient of 0.047 at 298.15<br>cem . The value was not<br>pothed data fit above. | Bartlesville, OK. Used as received.                                                                                                                                        |  |  |
| APPARATUS/PROCEDUR<br>modification of<br>Billett(1). Th                                                       | E: The apparatus is a<br>that of Morrison and<br>ne modifications in-                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$                                                                                  |  |  |
| clude the addit                                                                                               | ion of a spiral stor-                                                                                                                                                   | 1 ÷                                                                                                                                                                        |  |  |
| a constant refe                                                                                               | erence pressure, and an                                                                                                                                                 | REFERENCES:                                                                                                                                                                |  |  |
| extra buret for<br>The solvent is<br>cation of the m                                                          | nighly soluble gases.<br>degassed by a modifi-<br>method of Baldwin and                                                                                                 | I. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br>ibid.1952, 3819.                                                                                           |  |  |
| Daniel (2).                                                                                                   |                                                                                                                                                                         | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl</u>. <u>Chem</u>. 1952, <u>2</u>, 161.</li> </ol>                                                                    |  |  |

COMPONENTS: EVALUATOR: 1. Neon; Ne; 7440-01-9 H. L. Clever Chemistry Department 2. Decane; C10H22; 124-18-5 Emory University Atlanta, GA 30322 U.S.A. February 1978

CRITICAL EVALUATION:

The solubility of neon in decane was measured in three laboratories. Clever, Battino, Saylor and Gross (1) report three solubility values be-tween 289.05 and 312.15 K. Makranczy, Megyery-Balog, Rusz and Patyi (2) and Wilcock, Battino and Danforth (3) each report one solubility value near 298 K.

The solubility value of Makranczy et al. (Ostwald coefficient 4.5 x  $10^{-2}$  and mole fraction 3.6 x  $10^{-4}$  at 298.15 K) agrees well with the value of Clever et al., but it is reported to only two significant figures.

The solubility values of Clever et al. and Wilcock et al. differ by 3.9 percent at 298.15 K which is within the estimated error of the two laboratories. The Wilcock et al. solubility determination uses an improved degassing procedure, and improved control of temperature and pressure. Their solubility value should be considered the more reliable. It is a mole fraction of  $3.430 \times 10^{-4}$  at 298.27 K.

Without other solubility values to compare at several temperatures it is not possible to recommend values of solubility and thermodynamic changes. We have used the data of Clever <u>et al</u>. and Wilcock <u>et al</u>. on a one to one weight basis to obtain a tentative set of solubility data and changes in thermodynamic properties. The discussion above indicates the tentative solubility values may be 2 percent or more high.

The tentative values for the transfer of one mole of neon from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

> $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 6,536.6 + 44.288 T$ Std. Dev.  $\Delta G^{\circ} = 44.2$ , Coef. Corr. = 0.9946  $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,536.6, \quad \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -44.288$

The tentative solubility values and Gibbs energy change as a function of temperature are in Table 1.

TABLE 1. The solubility of neon in decane. Tentative values of the mole fraction solubility at 101.325 kPa and the Gibbs energy change as a function of temperature.

| т/к                        | Mol Fraction $X_1 \times 10^4$ | $\Delta G^{\circ}/J mol^{-1}$ |
|----------------------------|--------------------------------|-------------------------------|
| 288.15<br>293.15<br>298.15 | 3.17<br>3.33<br>3.48           | 19,298<br>19,520<br>19,741    |
| 308.15<br>313.15           | 3.83<br>3.79<br>3.95           | 20,184<br>20,405              |

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1. 1957, 61, 1078.

2. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind.

Chem. 1976, 4, 269. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. Chem. Thermodyn. 1978, 10, 817. 3.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | i                                   |                                            |                      |                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------|--------------------------------------------|----------------------|-----------------------------------------------|
| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       | ORIGINAL MEASUREMENTS:              |                                            |                      |                                               |
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       | Clever, H.L.; Battino, R.;          |                                            |                      |                                               |
| 2. Decane; C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0 <sup>H</sup> 22; 12 | 4-18-5                              |                                            | <i>buytot</i> ,      |                                               |
| ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 22                  |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | J. Ph                                      | ys Che               | m. 1957, 61, 1078-1083.                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | _                                          |                      |                                               |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                                     | PREPAR                                     | ED BY.               |                                               |
| т/к:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 289.05 ·              | - 312.15                            | 1 1001 1110                                | ייים מם.<br>ת        | I. Jong                                       |
| P/kPa:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 101.325               | (l atm)                             |                                            | P                    | .L. Long                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
| EXPERIMENTAL VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ES:                   |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | T/K                   | Mol Fraction                        | Buns                                       | en                   | Ostwald                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | oerri                                      | cient                | coefficient                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | $X_1 \times 10^{-1}$                | αχ                                         | 10-                  | L x 10                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 289.05                | 3,18                                | 3 6                                        | 8                    | 3 89                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 298.15                | 3.57                                | 4.0                                        | 7                    | 4.44                                          |
| -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 312.15                | 3.90                                | 4.3                                        | 9                    | 5.02                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | 3                                   |                                            |                      |                                               |
| Smoothed Data:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ∆G <sup>O</sup> /J 1  | $mol^{-1} = - RT ln$                | $x_1 = 0$                                  | 6460.8               | + 44.500 T                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Std. De               | ev. $\Delta G^{\circ} = 44.8$ ,     | Coef.                                      | Corr.                | = 0.9963                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
| The solubility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | values v              | were adjusted to                    | a par                                      | rtial p              | ressure of neon of                            |
| 101.325 kPa (1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | atm) by               | Henry's law.                        | •                                          | 1                    |                                               |
| The Bunsen coe:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | fficient              | s were calculate                    | d by t                                     | the com              | piler.                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | -                                          |                      |                                               |
| See the evaluat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | tion of r             | neon + decane fo<br>v values        | r the                                      | recomm               | ended Gibbs energy equation                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | y varues.                           |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
| <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | AUXILIARY                           | INFORM                                     | ATION                |                                               |
| METHOD:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |                                     | SOURCE                                     | AND PUR              | TTY OF MATERIALS:                             |
| Volumetric.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The so                | lvent is satu-                      | 1. 1                                       | Neon.                | Matheson Co., Inc. Both                       |
| rated with the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | gas as :              | it flows through                    |                                            | standar              | d and research grades                         |
| an 8 mm x 180 (<br>to a gas buret                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | cm glass<br>. The to  | spiral attached<br>stal pressure of |                                            | were us<br>results   | ed with no difference in                      |
| solute gas plus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | s solvent             | t vapor pressure                    | -                                          |                      |                                               |
| is maintained a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | at 1 atm              | as the gas is                       | 2. I                                       | Decane.              | Humphrey-Wilkinson, Inc.                      |
| absorbed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |                                     |                                            | snaken v             | with $H_2SO_4$ , washed, dried,               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            | istill               | εα.                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DE                    |                                     | ESTIM                                      | ATED ERRO            | DR:                                           |
| The spread to the second secon | KL:<br>10 ic          | nodification of                     |                                            |                      | $\delta T/K = 0.05$                           |
| that of Morriso                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | on and Bi             | illett(1). The                      | $\frac{\delta P}{\delta X_{\star}} = 0.03$ |                      |                                               |
| modifications include the addition of<br>a spiral storage for the solvent, a<br>manometer for a constant reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                                     |                                            |                      | T, T                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | REFERI                                     | ENCES:               |                                               |
| pressure, and an extra buret for<br>highly soluble gases. The solvent is<br>degassed by a modification of the<br>method of Baldwin and Daniel (2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       | 1. N                                | Aorriso<br>L. Chem                         | n, T.J.; Billett, F. |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | ibid 19                                    | 52, 3819.            |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     | 2. H                                       | Baidwin<br>J. Amil   | , K.K.; Daniel, S.G.<br>. Chem. 1952. 2. 161. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                                     |                                            |                      | <u> </u>                                      |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E. 2. Decane; C<sub>10</sub>H<sub>22</sub>; 124-18-5 J. Chem. Thermodyn. 1978, 10, 817-822 VARIABLES: PREPARED BY: T/K: 298.24 A.L. Cramer 101.325 (1 atm) P/kPa: **EXPERIMENTAL VALUES:** T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 298.24 3.430 3,928 4.288 See the evaluation of neon + decane for recommended Gibbs energy equation and smoothed solubility values. The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law. The Bunsen coefficients were calculated by the compiler. A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122 - 128; Chem. Abstr. 1977, 86, 22375d. AUXILIARY INFORMATION METHOD /APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: The apparatus is based on the de-1. Neon. Matheson Co. Inc. sign of Morrison and Billett (1), and Purest commercially available the version used is described by grade. Battino, Evans, and Danforth (2). The degassing apparatus and procedure are 2. Decane. Phillips Petroleum Co. described by Battino, Banzhof, Bogan, and Wilhelm (3). See neon + octane data sheet for 99 mol per cent minimum. more details. **ESTIMATED ERROR:**  $\delta T/K = 0.03$  $\delta P/mmHg = 0.5$  $\delta X_1 / X_1 = 0.02$ **REFERENCES:** 1.Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033. 2.Battino,R.;Evans,F.D.;Danforth,W.F. J.Am.Oil Chem. Soc. 1968, 45, 830. 3.Battino,R.;Banzhof,M.;Bogan, M.; Wilhelm,E. Anal. Chem. 1971, 43, 806.
| COMPONENTS                   |                             |         |                     |                          | · · · · · · · · · · · · · · · · · · · |
|------------------------------|-----------------------------|---------|---------------------|--------------------------|---------------------------------------|
| COMPONENTS:                  |                             |         | ORIGINAL MEAS       | UREMENTS :               |                                       |
| 1. Neon; Ne; 744             | 10-01-9                     |         | Makranczy,          | J.; Megyery-Ba           | alog, K.;                             |
| 2. Undecane; C <sub>11</sub> | H <sub>24</sub> ; 1120-21-4 |         |                     | ,                        |                                       |
| 3                            |                             |         |                     |                          |                                       |
|                              |                             |         | Uung T T            | nd Cham 1076             | 1 260-200                             |
| WADTADIES.                   |                             |         | nung. J. I.         | <u>na. cnem</u> . 1976,  | <u>4</u> , 209-280.                   |
| Т/К: 29                      | 98.15                       |         | PREPARED BY:        |                          |                                       |
| P/kPa: 10                    | )1.325 (1 atm)              |         | s                   | . A. Johnson             |                                       |
|                              |                             |         |                     |                          |                                       |
| EXPERIMENTAL VALUES:         |                             | Lion    | Bungon              | 0.0001.0                 |                                       |
|                              | T/K MOI FIACT               | , (     | Coefficient         | Coefficient              |                                       |
|                              | X <sub>1</sub> x 10         | 04      | α x 10 <sup>2</sup> | $L \times 10^2$          |                                       |
| 29                           | 8.15 3.7                    |         | 3.9                 | 4.3                      |                                       |
|                              |                             |         |                     |                          |                                       |
| The mole fraction            | and Bunsen coe              | efficie | ent were cal        | culated by the           | compiler.                             |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
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|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              | AUX                         |         | INFORMATION         |                          |                                       |
| METHOD:                      |                             |         | SOURCE AND PUI      | RITY OF MATERIALS:       |                                       |
| Volumetric method            | . The apparatu              | is of   | Both the ga         | s and liquid we          | ere analyti-                          |
| used.                        | , and sipos (I)             | was     | foreign ori         | gin. No furthe           | er informa-                           |
|                              |                             |         | tion.               |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |
| APPARATUS / PROCEDURE •      |                             |         | ESTIMATED ERR       | OR:                      |                                       |
|                              |                             |         |                     | $\delta X_1 / X_1 = 0.0$ | )3                                    |
|                              |                             |         |                     | - I                      |                                       |
|                              |                             |         | DEEEDENORG          |                          |                                       |
|                              |                             |         | L. Bodor            | E.: Bor. Gv ·            | Mohai, B.:                            |
|                              |                             |         | Sipo                | s, G.                    |                                       |
|                              |                             |         | Veszpr              | emi Vegyip. Egy          | . <u>Kozl</u> .                       |
|                              |                             |         | Chem.               | Abstr. 1961, 55          | 5, 3175h.                             |
|                              |                             |         |                     |                          |                                       |
|                              |                             |         |                     |                          |                                       |

| COMPONENTS:                                                                                                                         | ORIGINAL MEASUREMENTS:                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                     | Clever, H. L.; Battino, R.;                                                                                                                                     |
| 1. Neon; Ne; 7440-01-9                                                                                                              | Saylor, J. H.; Gross, P. M.                                                                                                                                     |
| 2. Dodecane; C <sub>12</sub> H <sub>26</sub> ; 112-40-3                                                                             |                                                                                                                                                                 |
|                                                                                                                                     | J. Phys. Chem. 1957, 61, 1078 - 1083.                                                                                                                           |
|                                                                                                                                     |                                                                                                                                                                 |
| VARIABLES:                                                                                                                          | PREPARED BY:                                                                                                                                                    |
| т/к: 289.05 - 312.15                                                                                                                | P. L. Long                                                                                                                                                      |
| P/kPa: 101.325 (1 atm)                                                                                                              |                                                                                                                                                                 |
| EXPERIMENTAL VALUES:                                                                                                                |                                                                                                                                                                 |
| T/K Mol Fraction                                                                                                                    | Bunsen Ostwald                                                                                                                                                  |
| $X_{1} \times 10^{4}$                                                                                                               | $\alpha \times 10^2$ L x 10 <sup>2</sup>                                                                                                                        |
| 289.05 2.81                                                                                                                         | 2 77 2 03                                                                                                                                                       |
| 298.15 3.24                                                                                                                         | 3.18 3.47                                                                                                                                                       |
| 312.15 3.50                                                                                                                         | 3.39 3.87                                                                                                                                                       |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$                                                                            | $X_1 = 6,855.7 + 44.092 T$                                                                                                                                      |
| Std. Dev. $\wedge G^\circ = 73.6$ .                                                                                                 | Coef. Corr. = 0.9899                                                                                                                                            |
|                                                                                                                                     |                                                                                                                                                                 |
| $\Delta H^{0}/J \text{ mol}^{-} = 6,855.7$                                                                                          | $\Delta S^{0}/J K^{-} mol^{-} = -44.092$                                                                                                                        |
| T/K Mol Fract                                                                                                                       | $\Delta G^{\circ}/J \text{ mol}^{-1}$                                                                                                                           |
|                                                                                                                                     |                                                                                                                                                                 |
| 293.15 2.99                                                                                                                         | 19,781                                                                                                                                                          |
| 298.15 3.13                                                                                                                         | 20,002                                                                                                                                                          |
| 303.15 3.28                                                                                                                         | 20,222                                                                                                                                                          |
| 313.15 3.58                                                                                                                         | 20,663                                                                                                                                                          |
| The solubility values were adjusted to                                                                                              | a partial pressure of neon of                                                                                                                                   |
| 101.325 kPa (1 atm) by Henry's law.                                                                                                 |                                                                                                                                                                 |
| The Bunsen coefficients were calculate                                                                                              | ed by the compiler.                                                                                                                                             |
|                                                                                                                                     |                                                                                                                                                                 |
|                                                                                                                                     |                                                                                                                                                                 |
| AUXILIARY                                                                                                                           | INFORMATION                                                                                                                                                     |
| METHOD: Volumetric. The solvent is sat-                                                                                             | SOURCE AND PURITY OF MATERIALS:                                                                                                                                 |
| urated with the gas as it flows                                                                                                     | 1. Neon. Matheson Co., Inc. Both                                                                                                                                |
| attached to a gas buret. The total                                                                                                  | were used with no difference in                                                                                                                                 |
| pressure of solute gas plus solvent                                                                                                 | results.                                                                                                                                                        |
| as the gas is absorbed.                                                                                                             | 2. Dodecane. Humphrey-Wilkinson,                                                                                                                                |
| ADDED NOTE. Makranczy, J.: Megverv-                                                                                                 | Inc. Shaken with H <sub>2</sub> SO <sub>4</sub> , washed,                                                                                                       |
| Balog, K.; Rusz, L.; Patyi, L. Hung. J.                                                                                             | dried over Na.                                                                                                                                                  |
| Ind. Chem. 1976, <u>4</u> , 269 report an<br>Ostwald coefficient of 0.040 at 298.15                                                 |                                                                                                                                                                 |
| K for this system. The value was not                                                                                                |                                                                                                                                                                 |
| used in the smoothed data fit above.                                                                                                | ESTIMATED ERROR:                                                                                                                                                |
| APPARATUS/PROCEDURE: The apparatus is a                                                                                             | $\delta T/K = 0.05$                                                                                                                                             |
| Billett(1). The modifications in-                                                                                                   | $\delta P / COII = 3$<br>$\delta X_1 / X_1 = 0.03$                                                                                                              |
| clude the addition of a spiral stor-                                                                                                |                                                                                                                                                                 |
| a constant reference pressure, and an                                                                                               |                                                                                                                                                                 |
|                                                                                                                                     | REFERENCES:                                                                                                                                                     |
| extra buret for highly soluble gases.                                                                                               | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.                                                                                     |
| extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and                | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br><u>ibid</u> .1952, 3819.                                                         |
| extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and<br>Daniel (2). | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br><u>ibid</u> .1952, 3819.<br>2. Baldwin, R. R.; Danjel, S. G.                     |
| extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and<br>Daniel (2). | <pre>REFERENCES: 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819. 2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.</pre> |

| COMPONENTS:                                              | ORIGINAL MEASUREMENTS:                       |
|----------------------------------------------------------|----------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                   | Makranczy, J.; Megyery-Balog, K.;            |
| 2. Tridecane; C <sub>13</sub> H <sub>28</sub> ; 629-50-5 |                                              |
| 10                                                       |                                              |
|                                                          |                                              |
|                                                          | <u>Hung. J. Ind. Chem. 1976, 4, 269-280.</u> |
| VARIABLES:                                               | PREPARED BY:                                 |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)                    | S. A. Johnson                                |
| 17 M 41 101000 (1 40m)                                   |                                              |
| EXPERIMENTAL VALUES:                                     |                                              |
| T/K Mol Fraction                                         | Bunsen Ostwald                               |
| $x_{1} \times 10^{4}$                                    | $\alpha \times 10^2$ L x $10^2$              |
|                                                          | 3 3 3 6                                      |
|                                                          | 5.5 5.0                                      |
| The mole fraction and Bunsen coeffici                    | ent were calculated by the compiler.         |
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| <u> </u>                                                 |                                              |
| AUXILIARY                                                | INFORMATION                                  |
| METHOD:                                                  | SOURCE AND PURITY OF MATERIALS:              |
| Volumetric method. The apparatus of                      | Both the gas and liquid were analyti-        |
| Bodor, Bor, Mohai, and Sipos (1) was                     | cal grade reagents of Hungarian or           |
| useu.                                                    | tion.                                        |
|                                                          |                                              |
|                                                          |                                              |
|                                                          |                                              |
|                                                          |                                              |
|                                                          |                                              |
|                                                          | I<br>FSTIMATED FRROR.                        |
| APPARATUS/PROCEDURE:                                     | LOTTINTED ERROR.                             |
|                                                          | $\delta X_{2} / X_{2} = 0.03$                |
|                                                          | 0.1. VT = 0.00                               |
|                                                          | REFERENCES:                                  |
|                                                          | 1. Bodor, E.; Bor, Gy.; Mohai, B.;           |
|                                                          | Sipos, G.                                    |
|                                                          | veszpremi vegyip. Egy. Kozi.<br>1957, 1, 55; |
|                                                          | Chem. Abstr. 1961, 55, 3175h.                |
|                                                          |                                              |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. Tetradecane; C14H30; 629-59-4 2. J. Phys. Chem. 1957, 61, 1078 - 1083. VARIABLES: PREPARED BY: т/к: 289.05 - 313.25 P. L. Long P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES: Mol Fraction T/K Bunsen Ostwald  $\begin{array}{c} \text{Coefficient} \\ \alpha \ x \ 10^2 \end{array}$ Coefficient  $X_1 \times 10^4$  $L \times 10^{2}$ 3.00 2.66 2.82 289.05 3.24 2.90 3.16 298.15 313.25 3.63 3.16 3.62 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 5,920.3 + 46.956 T$ Std. Dev.  $\Delta G^{\circ} = 2.3$ , Coef. Corr. = 0.9999  $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,920.3 \quad \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -46.956$ Mol Fraction  $\Delta G^{\circ}/J \text{ mol}^{-1}$ X<sub>1</sub> x 10<sup>4</sup> T/K 288.15 2.98 19,451 3.11 19,685 293.15 3.24 19,920 298.15 20,155 303.15 3.37 308.15 3.50 20,390 313.15 20,624 3.63 318.15 3.76 20,859 The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat-urated with the gas as it flows SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. urated with the gas as it flows Both standard and research grades through an 8 mm x 180 cm glass spiral attached to a gas buret. The total were used with no difference in results. pressure of solute gas plus solvent vapor pressure is maintained at 1 atm 2. Tetradecane. Humphrey-Wilkinson, as the gas is absorbed. Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, ADDED NOTE.Makranczy, J.; Megyerydried over Na. Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.033 at 298.15 K for this system. The value was not used in the smoothed data fit above. ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a  $\delta T/K = 0.05$ modification of that of Morrison and Billett(1). The modifications in- $\delta P/torr = 3$  $\delta X_1 / X_1 = 0.03$ clude the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an REFERENCES: extra buret for highly soluble gases. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; The solvent is degassed by a modification of the method of Baldwin and <u>ibid.1952, 3819.</u> Daniel (2). 2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

| COMPONENTS:                                                | ORIGINAL MEASUREMENTS:                                                                 |
|------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                     | Makranczy, J.; Megyery-Balog, K.;<br>Rusz, L.; Patyi, L.                               |
| 2. Pentadecane; C <sub>15</sub> H <sub>32</sub> ; 629-62-9 |                                                                                        |
| or                                                         |                                                                                        |
| Hexadecane; C <sub>16</sub> H <sub>34</sub> ; 544-76-3     | <u>Hung. J. Ind. Chem. 1976, 4, 269-280.</u>                                           |
| VARIABLES:                                                 | PREPARED BY:                                                                           |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)                      | S. A. Johnson                                                                          |
| EXPERIMENTAL VALUES:                                       |                                                                                        |
| T/K Mol Fraction<br>X, x 10 <sup>4</sup>                   | n Bunsen Ostwald<br>Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup> |
| Pentadeo                                                   | cane: C15H22: 629-62-9                                                                 |
| 298.15 3.5                                                 | 2.8 3.1                                                                                |
| Hexadeca                                                   | ane; $C_{1,c}H_{2,4}$ ; 544-76-3                                                       |
| 298.15 3.2                                                 | 2.5 2.7                                                                                |
|                                                            |                                                                                        |
| The mole fraction and Bunsen coeff:                        | icient were calculated by the compiler.                                                |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
| AUXILI                                                     | ARY INFORMATION                                                                        |
| METHOD:                                                    | SOURCE AND PURITY OF MATERIALS:                                                        |
| Volumetric method. The apparatus of                        | of Both the gas and liquid were analyti-                                               |
| Bodor, Bor, Mohai, and Sipos (1) wa<br>used.               | as cal grade reagents of Hungarian or foreign origin. No further informa-              |
|                                                            | tion.                                                                                  |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
|                                                            |                                                                                        |
| APPARATUS / PROCEDURE :                                    | ESTIMATED ERROR:                                                                       |
|                                                            | $\delta x_{1}/x_{1} = 0.03$                                                            |
|                                                            |                                                                                        |
|                                                            | REFERENCES:                                                                            |
|                                                            | 1. Bodor, E.; Bor, Gy.; Mohai, B.;                                                     |
|                                                            | Sıpos, G.<br>Veszpremi Vegyip. Egv. Kozl.                                              |
|                                                            | 1957, 1, 55;<br>Chem Abstr 1961 55 3175b                                               |
|                                                            | <u>Chem. 19501</u> , 1901, <u>33</u> , 31/31.                                          |

| COMPONENTS:                                                                                         | EVALUATOR:                                                                                                     |
|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <ol> <li>Neon; Ne; 7440-01-9</li> <li>Cyclohexane; C<sub>6</sub>H<sub>12</sub>; 110-82-7</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322<br>U. S. A.<br>January 1978 |

The solubility of neon in cyclohexane was measured at three laborator-Lannung (1) reported seven solubility values between 288.15 and 303.15 ies. K; Clever, Battino, Saylor and Gross (2) reported three values between 287.15 and 312.15 K; and Dymond (3) reported four solubility values between 292.97 and 310.50 K.

Each data set was smoothed by the method of least squares fit to a Gibbs energy equation linear in temperature. The Lannung and Dymond smoothed solubility values differed by 5 - 5.5 percent over the temperature range of 288.15 - 303.15 K, while the Clever, Battino, Saylor and Gross smoothed solubility values ranged lower than the Dymond data from 2.4 per cent at 288.15 K to 12 per cent at 313.15 K. The three data sets were combined in one least square fit to a Gibbs energy equation that was linear in temperature. No solubility value was over two standard deviations from the fit-ted equation, but of the 14 solubility values five were of greater magnitude than the fitted line and nine were of lesser magnitude. An arbitrary decision was made to drop the two lowest values both of which were from the same paper (2). The twelve data points were used to obtain the recommended equation.

The recommended thermodynamic values for the transfer of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

> $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 9661.6 + 39.074 T$ Std. Dev. ∆G° = 63, Coef. Corr. = 0.9778

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 9661.6, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -39.074$ 

Table 1 contains the recommended values of the mole fraction solubility and the Gibbs energy at five degree intervals between 283.15 and 313.15 K.

TABLE 1. Solubility of neon in cyclohexane at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| т/к    | Mol Fraction <sup>a</sup><br>X <sub>l</sub> x 10 <sup>4</sup> | ∆G°/J mol <sup>-1</sup> |
|--------|---------------------------------------------------------------|-------------------------|
| 283.15 | 1.500                                                         | 20,725                  |
| 288.15 | 1.615                                                         | 20,921                  |
| 293.15 | 1.730                                                         | 21,116                  |
| 298.15 | 1.845                                                         | 21,312                  |
| 303.15 | 1.970                                                         | 21,507                  |
| 308.15 | 2.095                                                         | 21,702                  |
| 313.15 | 2.225                                                         | 21,898                  |
|        |                                                               |                         |

<sup>a</sup>rounded to the nearest 0.005 x 10<sup>-4</sup>.

1.

Lannung, A. J. Am. <u>Chem.</u> Soc. 1930, <u>52</u>, 68. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. <u>J. Phys. Chem</u>. 2. 1957, <u>61</u>, 1078.

3. Dymond, J. H. J. Phys. Chem. 1967, 71, 1829.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | · · · · · · · · · · · · · · · · · · ·                |                                                                |                                                                        |                                                                                                                                                                         | _                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |                                                                | ORIGINAL ME                                                            | ASUREMENTS:                                                                                                                                                             |                                                              |
| 1. Neon; Ne; 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 440-01-9                                             |                                                                | Lannung,                                                               | Α.                                                                                                                                                                      |                                                              |
| 2. Cyclohexane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | e; C <sub>6</sub> H <sub>12</sub> ;                  | 110-82-7                                                       |                                                                        |                                                                                                                                                                         |                                                              |
| -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |                                                                | <u>J. Am. Ch</u>                                                       | <u>em. Soc</u> . 1930, <u>5</u> 2                                                                                                                                       | 2, 68 - 80.                                                  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      |                                                                | PREPARED BY                                                            | :                                                                                                                                                                       |                                                              |
| T/K: 2<br>Ne P/kPa: 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 88.15 - 3<br>.01.325 (1                              | 03.15<br>atm)                                                  |                                                                        | P. L. Long                                                                                                                                                              |                                                              |
| EXPERIMENTAL VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2S :                                                 |                                                                | -                                                                      |                                                                                                                                                                         |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | T/K                                                  | Mol Fraction                                                   | Bunsen                                                                 | Ostwald                                                                                                                                                                 |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ·                                                    | $x_{1} \times 10^{4}$                                          | $\begin{array}{c} \text{Coefficien} \\ \alpha \times 10^2 \end{array}$ | t Coefficient<br>L x 10 <sup>2</sup>                                                                                                                                    |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 288.15                                               | 1.60                                                           | 3.34                                                                   | 3.52                                                                                                                                                                    |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 288.15                                               | 1.57                                                           | 3.27                                                                   | 3.45                                                                                                                                                                    |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 293.15                                               | 1.71                                                           | 3.54                                                                   | 3.80                                                                                                                                                                    |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 293.15                                               | 1.70                                                           | 3.53                                                                   | 3.79                                                                                                                                                                    | •                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 298.15                                               | 1.81                                                           | 3./3                                                                   | 4.07                                                                                                                                                                    |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 303.15                                               | 1.92                                                           | 3.93                                                                   | 4.36                                                                                                                                                                    |                                                              |
| Smoothed Data:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ∆G°/J mo                                             | $1^{-1} = - RT ln$                                             | $X_1 = 9,092$                                                          | .5 + 41.164 T                                                                                                                                                           | -                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Std. Dev                                             | . ∆G° = 16.9,                                                  | -<br>Coef. Cor                                                         | r. = 0.9979                                                                                                                                                             |                                                              |
| The solubility<br>101.325 kPa (1<br>The mole fracti<br>the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | values we<br>atm) by H<br>on solubi                  | re adjusted to<br>enry's law.<br>lity and the O                | a partial<br>stwald coe                                                | pressure of neon                                                                                                                                                        | of .                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                      | AUXILIARY                                                      | INFORMATION                                                            |                                                                                                                                                                         |                                                              |
| METHOD:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |                                                                | SOURCE AND                                                             | PURITY OF MATERIALS:                                                                                                                                                    |                                                              |
| Gas absorption.<br>rated with solv<br>volume absorbed<br>between initial                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | The gas<br>ent vapor<br>is the da<br>and fina        | is presatu-<br>. The gas<br>ifference<br>l gas vol-            | 1. Neon.<br>Conta<br>of he                                             | Linde's Liquid<br>ined one percent<br>lium.                                                                                                                             | Air Factory.<br>by volume                                    |
| umes. The amou<br>mined by the we<br>placed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | nt of solv<br>ight of me                             | vent is deter-<br>ercury dis-                                  | 2. Cyclo<br>Shake<br>washe<br>led f<br>first<br>sodiu                  | hexane. Poulenc<br>n with fuming H <sub>2</sub> S<br>d, dried over P <sub>2</sub> C<br>rom P <sub>2</sub> O <sub>5</sub> with rej<br>quarter. Distil<br>m. m.p. 6.3° C. | Frères.<br>04, water<br>95. Distil-<br>ection of<br>led from |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | C . ml                                               |                                                                | ESTIMATED EN                                                           | RROR:                                                                                                                                                                   |                                                              |
| modification of<br>(1). A calibration and biogramma and biogr | E: The appa<br>that of v<br>ted, combi<br>ulb is end | aratus is a<br>von Antropoff<br>ined all glass<br>closed in an |                                                                        | $\delta T/K = 0.03$                                                                                                                                                     |                                                              |
| the calibration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | and confi                                            | ining liquid.                                                  | REFERENCES:                                                            |                                                                                                                                                                         |                                                              |
| The solvent is a<br>ratus. The solv<br>shaken together<br>established.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | degassed i<br>vent and t<br>until equ                | in the appa-<br>the gas are<br>uilibrium is                    | l. v. An<br><u>Z. Ele</u>                                              | tropoff, A.<br>ectrochem. 1919,                                                                                                                                         | <u>25</u> , 269.                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                      |                                                                |                                                                        |                                                                                                                                                                         |                                                              |

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| COMPONENTS:                                                                                                                                                                                           | ORIGINAL MEASUREMENTS:                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <ol> <li>Neon; Ne; 7440-01-9</li> <li>Cyclohexane; C<sub>6</sub>H<sub>12</sub>; 110-82-7</li> </ol>                                                                                                   | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.                                                                        |
|                                                                                                                                                                                                       | J. Phys. Chem. 1957. 61, 1078 - 1083.                                                                                             |
| VARIABLES:                                                                                                                                                                                            | PREPARED BY                                                                                                                       |
| T/K: 287.15 - 312.15<br>P/kPa: 101.325 (1 atm)                                                                                                                                                        | P. L. Long                                                                                                                        |
| EXPERIMENTAL VALUES:                                                                                                                                                                                  |                                                                                                                                   |
| $\frac{T/K}{x_1 \times 10^4}$                                                                                                                                                                         | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$                                                      |
| 287.15 1.65<br>298.15 1.74<br>312.15 2.02                                                                                                                                                             | 3.46 3.64<br>3.59 3.92<br>4.10 4.69                                                                                               |
| Smoothed Data: $\Delta G^{\circ}/J \mod 1 = - RT \ln$                                                                                                                                                 | X <sub>1</sub> = 6,159.0 + 51.094 T                                                                                               |
| Std. Dev. ∆G° = 57.2,                                                                                                                                                                                 | Coef. Corr. = 0.9960                                                                                                              |
| For the recommended free energy equati solubility of neon in cyclohexane.                                                                                                                             | on see the critical evaluation of the                                                                                             |
| The solubility values were adjusted to<br>kPa (l atm) by Henry's law.                                                                                                                                 | a partial pressure of neon of 101.325                                                                                             |
|                                                                                                                                                                                                       |                                                                                                                                   |
| AUXILIARY                                                                                                                                                                                             | INFORMATION                                                                                                                       |
| METHOD: Volumetric. The solvent is sat                                                                                                                                                                | SOURCE AND PURITY OF MATERIALS:                                                                                                   |
| urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure is maintained at 1 atm as the<br>gas is absorbed.                            | <ol> <li>Neon. Matheson Co. Both re-<br/>search and standard grades were<br/>used with no difference in re-<br/>sults.</li> </ol> |
|                                                                                                                                                                                                       | <ol> <li>Cyclohexane. Phillips Petroleum<br/>Co. Used as received.</li> </ol>                                                     |
|                                                                                                                                                                                                       | ESTIMATED EDDOD.                                                                                                                  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for | $\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$                                                             |
| a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and<br>Daniel (2).                          | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. <u>Chem. Soc</u> . 1948, 2033;<br><u>ibid</u> . 1952, 3819.                  |
|                                                                                                                                                                                                       | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl</u>. <u>Chem</u>. 1952, <u>2</u>, 161.</li> </ol>                           |

| COMPONENTS:                                                                      | ORIGINAL MEASUREMENTS:                                                                 |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                           | Dymond, J. H.                                                                          |
| 2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7                        |                                                                                        |
|                                                                                  | <u>J. Phys</u> . <u>Chem</u> . 1967, <u>71</u> , 1829 - 1831.                          |
| VARIABLES:                                                                       | PREPARED BY:                                                                           |
| T/K: 292.97 - 310.50<br>P/kPa: 101.325 (1 atm)                                   | M. E. Derrick                                                                          |
| EXPERIMENTAL VALUES:                                                             |                                                                                        |
| T/K Mol Fraction<br>$X_1 \times 10^4$                                            | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L x $10^2$                    |
| $\frac{1}{292.97}$ $\frac{1}{1.79}$                                              | 3.71 3.98                                                                              |
| 299.55 1.93                                                                      | 3.97 4.35                                                                              |
| 310.50 2.20                                                                      | 4.47 5.08                                                                              |
| Smoothed Data: $\triangle G^{\circ}/J \mod^{-1} = -RT \ln$                       | $X_1 = 8.826.6 + 41.634 T$                                                             |
|                                                                                  |                                                                                        |
| Std. Dev. $\Delta G^{\circ} = 12.5$ ,                                            | Coef. Corr. = 0.9992                                                                   |
| See the evaluation of neon + cyclohexa<br>equation and smoothed solubility value | ane for the recommended Gibbs energy<br>es.                                            |
| The Bunsen and Ostwald coefficients we                                           | ere calculated by the compiler.                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
| AUXILIARY                                                                        | INFORMATION                                                                            |
| METHOD:                                                                          | SOURCE AND PURITY OF MATERIALS:                                                        |
| tial pressure of gas equal to 1 atm.                                             | 1. Neon. Macheson Co. Diled.                                                           |
|                                                                                  | 2. Cyclohexane. Matheson, Coleman<br>and Bell chromatoguality reagent.                 |
|                                                                                  | Dried and fractionally frozen.                                                         |
|                                                                                  | m.p. 6.45° C.                                                                          |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |
|                                                                                  | ESTIMATED ERROR:                                                                       |
| APPARATUS/PROCEDURE:                                                             |                                                                                        |
| Dymond-Hildebrand apparatus (1) using<br>an all-glass pumping system to spray    | $\delta x_{1}/x_{1} = 0.01$                                                            |
| slugs of degassed solvent into the                                               |                                                                                        |
| lated from initial and final gas                                                 | REFERENCES:                                                                            |
| pressures.                                                                       | <ol> <li>Dymond, J.; Hildebrand, J. H.<br/>Ind. Eng. Chem. Fundam. 1967, 6,</li> </ol> |
|                                                                                  | 130.                                                                                   |
|                                                                                  |                                                                                        |
|                                                                                  |                                                                                        |

| COMPONENTS:                                                                   | ORIGINAL MEASUREMENTS:                                         |
|-------------------------------------------------------------------------------|----------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                        | Clever, H. L.; Saylor, J. H.<br>Gross, P. M.                   |
| 2. Methylcyclohexane; C <sub>7</sub> H <sub>14</sub> ;                        |                                                                |
| 108-87-2                                                                      | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 89 - 91.      |
| VARIABLES:                                                                    | PREPARED BY:                                                   |
| T/K: 289.15 - 316.25<br>P/kPa: 101.325 (1 atm)                                | P. L. Long                                                     |
|                                                                               |                                                                |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction                                      | Bunsen Ostwald                                                 |
| $x_1 \times 10^4$                                                             | Coefficient Coefficient                                        |
|                                                                               | 2 72 2 05                                                      |
| 303.15 2.34                                                                   | 4.09 4.54                                                      |
| 316.25 2.82                                                                   | 4.85 5.62                                                      |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$                       | $X_1 = 8,148.8 + 42.336 T$                                     |
| Std. Dev. ∆G° = 76.9,                                                         | Coef. Corr. = 0.9911                                           |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 8,148.8$                               | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -42.336$                 |
| T/K Mol Fract                                                                 | ion \G°/J mol <sup>-1</sup>                                    |
| $\frac{x_1 \times 10}{200 \times 15}$                                         | )*                                                             |
| 288.15 2.05<br>293.15 2.17                                                    | 20,348 20,560                                                  |
| 298.15 2.30                                                                   | 20,771                                                         |
| 303.15 2.42                                                                   | 21,195                                                         |
| 313.15 2.69                                                                   | 21,406                                                         |
| 318.15 2.82                                                                   | 21,618                                                         |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law. | o a partial pressure of neon of                                |
| The Bunsen coefficients were calculate                                        | ed by the compiler.                                            |
|                                                                               |                                                                |
| AUXILIARY                                                                     | INFORMATION                                                    |
| METHOD: Volumetric. The solvent is sat-                                       | SOURCE AND PURITY OF MATERIALS:                                |
| through an 8 mm x 180 cm glass spiral                                         | 1. Neon. Matheson Co., Inc. Both                               |
| attached to a gas buret. The total                                            | were used with no difference in                                |
| vapor pressure is maintained at 1 atm                                         | results.                                                       |
| as the gas is absorbed.                                                       | 2. Methylcyclohexane. Eastman                                  |
|                                                                               | Kodak Co., white label, dried over Na and distilled, corrected |
|                                                                               | b.p. 100.95 to 100.97°, lit. b.p.                              |
|                                                                               | 700.93°C.                                                      |
|                                                                               | POTIVATED EDDOD.                                               |
| APPARATUS/PROCEDURE: The apparatus is a                                       | $\delta T/K = 0.05$                                            |
| modification of that of Morrison and $Billet_{t}(1)$ . The modifications in-  | $\delta P/torr = 3$                                            |
| clude the addition of a spiral stor-                                          | 0x1/x1 = 0.05                                                  |
| age for the solvent, a manometer for<br>a constant reference pressure, and an | REFERENCES:                                                    |
| extra buret for highly soluble gases.                                         | 1. Morrison, T. J.; Billett, F.                                |
| The solvent is degassed by a modifi-<br>cation of the method of Baldwin and   | ibid.1952, 3819.                                               |
| Daniel (2).                                                                   | 2. Baldwin, R. R.: Daniel, S. G.                               |
|                                                                               | J. <u>Appl</u> . <u>Chem</u> . 1952, <u>2</u> , 161.           |
|                                                                               |                                                                |

| CONTROLLED .                                              | ······································                                 |
|-----------------------------------------------------------|------------------------------------------------------------------------|
| COMPONENTS:                                               | ORIGINAL MEASUREMENTS:                                                 |
| 1. Neon; Ne; 7440-01-9                                    | Wilcock, R. J.; Battino, R.<br>Wilhelm, F                              |
| 2. Cyclooctane; C <sub>8</sub> H <sub>16</sub> ; 292-64-8 | WIINEIM, E.                                                            |
|                                                           |                                                                        |
|                                                           | <u>J</u> . <u>Chem</u> . <u>Thermodyn</u> . 1977, <u>9</u> , 111-115.  |
| VARIABLES:                                                | PREPARED BY:                                                           |
| т/к: 298.21                                               | H. L. Clever                                                           |
| P/kPa: 101.325 (1 atm)                                    |                                                                        |
| EXPERIMENTAL VALUES:                                      |                                                                        |
|                                                           |                                                                        |
| T/K Mol Fraction                                          | Bunsen Ostwald<br>Coefficient Coefficient                              |
| $x_{1} \times 10^{4}$                                     | $\alpha \times 10^2$ L x $10^2$                                        |
| 298.21 1.372                                              | 2.28 2.491                                                             |
| The solubility value was adjusted t                       | o a partial pressure of peop of                                        |
| 101.325 kPa (1 atm) by Henry's law.                       | e a partial pressure of Meon Of                                        |
| The Bunsen coefficient was calculated                     | by the compiler.                                                       |
|                                                           |                                                                        |
|                                                           |                                                                        |
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|                                                           |                                                                        |
|                                                           | 1                                                                      |
|                                                           |                                                                        |
| AUXILIARY                                                 | INFORMATION                                                            |
| METHOD: The apparatus is based on the                     | SOURCE AND PURITY OF MATERIALS:                                        |
| and the version used is described by                      | 1. Neon. Matheson Co., Inc. Mini-                                      |
| Battino, Evans, and Danforth (2).                         | mum purity 99.99 mol per cent.                                         |
|                                                           | 2. Cyclooctane. Chemical Samples                                       |
| APPARATUS/PROCEDURE: Degassing. Up                        | Co. 99 mol per cent, fractionally                                      |
| to 500 cm <sup>3</sup> of solvent is placed in a          | 1.4562.                                                                |
| about 4 cm deep. The liquid is rapid                      |                                                                        |
| ly stirred and vacuum is applied in-                      |                                                                        |
| until the permanent gas residual                          |                                                                        |
| pressure drops to 5 microns.                              | ESTIMATED ERROR:                                                       |
| gassed solvent passes in a thin film                      | δ <b>τ/</b> Κ = 0.03                                                   |
| down a glass spiral containing the                        | $\delta P/mmHg = 0.5$                                                  |
| total pressure of one atm. The vol-                       | $\frac{0.1}{1} = 0.03$                                                 |
| ume of gas absorbed is measured in                        | ALFERENCES:                                                            |
| solvent is collected in a tared flask                     | J. Chem. Soc. 1948, 2033.                                              |
| and weighed.                                              | 2 Patting D. Prong D. D.                                               |
|                                                           | Danforth, W. F.                                                        |
|                                                           | J. <u>Am</u> . <u>Oil</u> <u>Chem</u> . <u>Soc</u> . 1968, <u>45</u> , |
|                                                           | 0.00.                                                                  |

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| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Geller, E.B.; Battino, R.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2. cis-1,2-Dimethylcyclohexane; $C_0H_1$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | WIINEIM, E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2207-01-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | J. Chem. Thermodyn. 1976, 8, 197-202.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| WADTADI EC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| T/K: 297.88 - 298.14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PREPARED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | n.n. cievei                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| T/K Mol Fraction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Bunsen Ostwald                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $\frac{\alpha \times 10^{-}}{2} \qquad \frac{L \times 10^{-}}{2}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2 5 6 2 9 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 297.88 2.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3.49 3.81                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <u>-</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| The solubility values were adjusted to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | a partial pressure of neon of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 101.325 kPa (1 atm) by Henry's law.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| The Purgon coefficients were calculate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | d by the compiler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| The Bunsen coefficients were calculate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | d by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc.,or Matheson Co.,<br>Inc. 99 mol % or better.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flack of such size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc.,or Matheson Co., Inc. 99 mol % or better. 2. cis-l,2-Dimethylcyclohexane. Chemical Samples Co. frace</pre>                                                                                                                                                                                                                                                                                                                                                     |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc.,or Matheson Co., Inc. 99 mol % or better. 2. cis-1,2-Dimethylcyclohexane. Chemical Samples Co., frac- tionally distilled and stored</pre>                                                                                                                                                                                                                                                                                                                      |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp;    Chemicals, Inc., or Matheson Co.,    Inc. 99 mol % or better. 2. cis-1,2-Dimethylcyclohexane.    Chemical Samples Co., frac-    tionally distilled and stored    in dark. n<sub>p</sub>(298.15 K) 1.4337.</pre>                                                                                                                                                                                                                                                             |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better. 2. cis-l,2-Dimethylcyclohexane. Chemical Samples Co., frac- tionally distilled and stored in dark. n<sub>D</sub>(298.15 K) 1.4337.</pre>                                                                                                                                                                                                                                                                            |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better. 2. cis-1,2-Dimethylcyclohexane. Chemical Samples Co., frac- tionally distilled and stored in dark. n<sub>D</sub>(298.15 K) 1.4337.</pre>                                                                                                                                                                                                                                                                            |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.                                                                                                                                                                                                                                                                                                                                                                                             | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better. 2. cis-l,2-Dimethylcyclohexane. Chemical Samples Co., frac- tionally distilled and stored in dark. n<sub>D</sub>(298.15 K) 1.4337.</pre>                                                                                                                                                                                                                                                                            |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-                                                                                                                                                                                                                                                                                                                                                        | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. cis-1,2-Dimethylcyclohexane.<br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. n <sub>D</sub> (298.15 K) 1.4337.                                                                                                                                                                                                                                                                 |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin                                                                                                                                                                                                                                                                                                                  | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better. 2. cis-1,2-Dimethylcyclohexane. Chemical Samples Co., frac- tionally distilled and stored in dark. n<sub>D</sub>(298.15 K) 1.4337. ESTIMATED ERROR:</pre>                                                                                                                                                                                                                                                           |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-                                                                                                                                                                                                                                                                            | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp; Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better. 2. cis-1,2-Dimethylcyclohexane. Chemical Samples Co., frac- tionally distilled and stored in dark. n<sub>D</sub>(298.15 K) 1.4337. ESTIMATED ERROR:</pre>                                                                                                                                                                                                                                                           |
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| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of one<br>atm. The volume of gas absorbed is                                                                                                                                                     | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. <u>cis-1,2-Dimethylcyclohexane.</u><br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. $n_D$ (298.15 K) 1.4337.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$                                                                                                                                                                    |
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| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of one<br>atm. The volume of gas absorbed is<br>found by difference between the ini-<br>tial and final volumes in the buret                                                                      | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. <u>cis-1,2-Dimethylcyclohexane.</u><br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. n <sub>D</sub> (298.15 K) 1.4337.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Morrison, T.J.; Billett, F.                                                                                                          |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of one<br>atm. The volume of gas absorbed is<br>found by difference between the ini-<br>tial and final volumes in the buret<br>system. The solvent is collected in<br>a tared flask and woighed  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. <u>cis-1,2-Dimethylcyclohexane.</u><br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. n <sub>D</sub> (298.15 K) 1.4337.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033.                                                                     |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of one<br>atm. The volume of gas absorbed is<br>found by difference between the ini-<br>tial and final volumes in the buret<br>system. The solvent is collected in<br>a tared flask and weighed. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. <u>cis-1,2-Dimethylcyclohexane.</u><br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. $n_D$ (298.15 K) 1.4337.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033.<br>2. Battino, R.; Evans, F.D.;                                              |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of one<br>atm. The volume of gas absorbed is<br>found by difference between the ini-<br>tial and final volumes in the buret<br>system. The solvent is collected in<br>a tared flask and weighed. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. <u>cis-1,2-Dimethylcyclohexane.</u><br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. $n_D(298.15 \text{ K})$ 1.4337.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033.<br>2. Battino, R.; Evans, F.D.;<br>Danforth, W.F.                     |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm. deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of one<br>atm. The volume of gas absorbed is<br>found by difference between the ini-<br>tial and final volumes in the buret<br>system. The solvent is collected in<br>a tared flask and weighed. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.<br>2. cis-1,2-Dimethylcyclohexane.<br>Chemical Samples Co., frac-<br>tionally distilled and stored<br>in dark. $n_D(298.15 \text{ K})$ 1.4337.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2. Battino, R.; Evans, F.D.;<br>Danforth, W.F.<br>J. Am. Oil Chem. Soc. 1968, 45, |

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| COMPONENTS:                                                                                    | ORIGINAL MEASUREMENTS:                                                               |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                         | Geller, E.B.; Battino, R.;<br>Wilhelm, E.                                            |
| <pre>2. <u>trans</u>-1,2-Dimethylcyclohexane;<br/>C<sub>8</sub>H<sub>16</sub>; 6876-23-9</pre> |                                                                                      |
|                                                                                                | J. <u>Chem</u> . <u>Thermodyn</u> . 1976, <u>8</u> , 197-202.                        |
|                                                                                                |                                                                                      |
| VARIABLES:                                                                                     | PREPARED BY:                                                                         |
| T/K: 298.11<br>P/kPa: 101.325 (1 atm)                                                          | H.L. Clever                                                                          |
| EXPERIMENTAL VALUES:                                                                           |                                                                                      |
| T/K Mol Fraction                                                                               | Bunsen Ostwald                                                                       |
|                                                                                                | Coefficient Coefficient                                                              |
| $x_1 \times 10^4$                                                                              | $\frac{\alpha \times 10^2}{2}  L \times 10^2$                                        |
| 298.11 2.65                                                                                    | 4.26 4.66                                                                            |
|                                                                                                |                                                                                      |
| The solubility value was adjusted to a<br>101.325 kPa (l atm) by Henry's law.                  | partial pressure of neon of                                                          |
| The Bunsen coefficient was calculated :                                                        | by the compiler.                                                                     |
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| AUXILIARY                                                                                      | INFORMATION                                                                          |
|                                                                                                |                                                                                      |
| The apparatus is based on the de-                                                              | SOURCE AND PURITY OF MATERIALS;                                                      |
| sign by Morrison and Billett (1) and                                                           | Chemicals, Inc., or Matheson Co.,                                                    |
| the version used is described by                                                               | Inc. 99 mol % or better.                                                             |
| Degassing. Up to 500 cm <sup>3</sup> of sol-                                                   | 2. trans-1.2-Dimethylcyclohexane.                                                    |
| vent is placed in a flask of such size                                                         | Chemical Samples Co., fractional-                                                    |
| that the liquid is about 4 cm deep.                                                            | ly distilled and stored in dark.                                                     |
| The liquid is rapidly stirred and vacuum is applied intermittently                             | $n_{D}^{(298.15)}$ 1.4248.                                                           |
| through a liquid N <sub>2</sub> trap until the                                                 |                                                                                      |
| permanent gas residual pressure drops                                                          |                                                                                      |
| Solubility Determination. The de-                                                              |                                                                                      |
| gassed solvent passes in a thin film                                                           | ESTIMATED ERROR:                                                                     |
| down a glass spiral containing the                                                             | $\delta T/K = 0.03$                                                                  |
| a total pressure of one atm. The vol-                                                          | $\delta P / \text{mmHg} = 0.5$<br>$\delta X_{-} / X_{-} = 0.03$                      |
| ume of gas absorbed is measured in a                                                           |                                                                                      |
| buret system, and the solvent is                                                               | REFERENCES:                                                                          |
| weighed.                                                                                       | <ol> <li>Morrison, T.J.; Billett, F.<br/><u>J. Chem. Soc</u>. 1948, 2033.</li> </ol> |
|                                                                                                | 2. Battino, R.; Evans, F.D.;                                                         |
|                                                                                                | Danforth, W.F.<br>J. <u>Am</u> . <u>Oil Chem.</u> <u>Soc</u> . 1968, <u>45</u> ,     |
|                                                                                                | 0.00.                                                                                |

| COMPONENTS:                                                                                                   | ORIGINAL MEASUREMENTS:                                                                                                 |  |
|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--|
| 1. Neon; Ne; 7440-01-9                                                                                        | Geller, E.B.; Battino, R.;<br>Wilhelm, E.                                                                              |  |
| <pre>2. cis-1,3-Dimethylcyclohexane, 59 mol %; C<sub>8</sub>H<sub>16</sub>; 638-04-0</pre>                    |                                                                                                                        |  |
| 3. <u>trans</u> -1,3-Dimethylcyclohexane, 41<br>mol %; C <sub>8</sub> <sup>H</sup> <sub>16</sub> ; 2207-03-6  | <u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.                                                                  |  |
| VARIABLES:                                                                                                    | PREPARED BY:                                                                                                           |  |
| T/K: 298.15 - 298.40<br>P/kPa: 101.325 (1 atm)                                                                | H.L. Clever                                                                                                            |  |
| EXPERIMENTAL VALUES:                                                                                          |                                                                                                                        |  |
| T/K Mol Fraction                                                                                              | Bunsen Ostwald                                                                                                         |  |
| c<br>x x 10 <sup>4</sup>                                                                                      | Coefficient Coefficient $x = 10^2$                                                                                     |  |
|                                                                                                               |                                                                                                                        |  |
| 298.15 2.72<br>298.40 2.70                                                                                    | 4.18 4.56<br>4.15 4.53                                                                                                 |  |
| The solubility value was adjusted to a<br>101.325 kPa (l atm) by Henry's law.                                 | partial pressure of neon of                                                                                            |  |
| The Bunsen coefficient was calculated h                                                                       | v the compiler.                                                                                                        |  |
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|                                                                                                               | τηροβαιάτου                                                                                                            |  |
| AUXILIARI                                                                                                     |                                                                                                                        |  |
| METHOD/APPARATUS/PROCEDURE:                                                                                   | SOURCE AND PURITY OF MATERIALS:                                                                                        |  |
| The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by | <ol> <li>Neon. Either Air Products &amp;<br/>Chemicals, Inc., or Matheson Co.,<br/>Inc. 99 mol % or better.</li> </ol> |  |
| Battino, Evans, and Danforth (2).<br>See neon + 1,2 dimethvlcvclohexane                                       | 2. cis-1,3-Dimethvlcvclohexane.                                                                                        |  |
| data sheet for more detail.                                                                                   | Chemical Samples Co., binary mix-<br>ture, analysed by R. I. by auth-<br>ors, used as received.                        |  |
|                                                                                                               | 3. <u>trans</u> -1,3-Dimethylcyclohexane.<br>Chemical Samples Co., binary mix-<br>ture, analysed by R. I. by auth-     |  |
|                                                                                                               | DIS, USEd as received.                                                                                                 |  |
|                                                                                                               | ESTIMATED ERROR: $\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$                               |  |
|                                                                                                               | REFERENCES:                                                                                                            |  |
|                                                                                                               | <ol> <li>Morrison, T.J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033.</li> </ol>                                          |  |
|                                                                                                               | 2. Battino, R.; Evans, F.D.;                                                                                           |  |
|                                                                                                               | Danforth, W.F.<br>J. <u>Am</u> . <u>Oil</u> <u>Chem</u> . <u>Soc</u> . 1968, <u>45</u> ,<br>830.                       |  |

| COMPONENTS:<br>1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                  | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                         | Geller, E.B.; Battino, R.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 2. <u>cis</u> -1,4-Dimethylcyclohexane, 70<br>mol %; C <sub>8</sub> H <sub>16</sub> ; 624-29-3                                                                                                                                                                          | WINCHM, E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3. <u>trans</u> -1,4-Dimethylcyclohexane, 30<br>mol %; C <sub>8</sub> H <sub>16</sub> ; 2207-04-7                                                                                                                                                                       | <u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| VARIABLES:                                                                                                                                                                                                                                                              | PREPARED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                  | H.L. Clever                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| T/K Mol Fraction                                                                                                                                                                                                                                                        | Bunsen Ostwald                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                         | Coefficient Coefficient                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| $X_{1} \times 10^{4}$                                                                                                                                                                                                                                                   | $\alpha \times 10^2$ L x $10^2$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| · ·                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 298.14 2.66                                                                                                                                                                                                                                                             | 4.10 4.48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.                                                                                                                                                                                           | a partial pressure of neon of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| The Bunsen coefficients were calculated                                                                                                                                                                                                                                 | the compiler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| AUXILIARY                                                                                                                                                                                                                                                               | INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| AUXILIARY                                                                                                                                                                                                                                                               | INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| AUXILIARY<br>METHOD / APPARATUS / PROCEDURE :                                                                                                                                                                                                                           | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| COMPONENTS:                                         | EVALUATOR:                                        |
|-----------------------------------------------------|---------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                              | H. L. Clever<br>Chemistry Department              |
| 2. Benzene; C <sub>6</sub> H <sub>6</sub> ; 71-43-2 | Emory University<br>Atlanta, Georgia 30322<br>USA |
|                                                     | January 1978                                      |

The solubility of neon in benzene was measured by Lannung (1), by Clever, Battino, Saylor and Gross (2), and by de Wet (3). The three sets of solubility data, when smoothed by a Gibbs energy function linear in temperature, agree within 5.5 per cent at 288.15 K, 6.1 per cent at 298.15 K, and 8.3 per cent at 308.15 K. On combining the three data sets on a one to one weight basis by the method of least squares in a Gibbs energy equation linear in temperature,only one solubility value at 298.35 K (2) was more than two standard deviations from the linear equation. That solubility value was excluded and the data fitted again to obtain the recommended equation.

The recommended thermodynamic values for the transfer of one mole of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 10,467 + 40.301 T$ 

Std. Dev.  $\Delta G^{\circ} = 46$ , Coef. Corr. = 0.9945

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 10.467. \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -40.301$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes at five degree intervals between 283.15 and 313.15 are in Table 1.

## TABLE 1. Solubility of neon in benzene at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| т/к    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 283.15 | 0.920                          | 21,878                  |
| 288.15 | 0.944                          | 22,080                  |
| 293.15 | 1.071                          | 22,281                  |
| 298.15 | 1.151                          | 22,483                  |
| 303.15 | 1.23                           | 22,684                  |
| 308.15 | 1.32                           | 22,886                  |
| 313.15 | 1.41                           | 23,087                  |

1.

Lannung, A. J. Am. Chem. Soc. 1930, 52, 68. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 2. 1957, 61, 1078.

з. de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.

|                              |                                                    | 1                       | ······································     |
|------------------------------|----------------------------------------------------|-------------------------|--------------------------------------------|
| COMPONENTS:                  |                                                    | ORIGINAL MEAS           | UREMENTS:                                  |
| 1. Neon; Ne;                 | 7440-01-9                                          | Lannung, A.             |                                            |
| 2 Depression C               | ······································             |                         |                                            |
| 2. Benzene; C                | 6H6; /1-43-2                                       |                         |                                            |
|                              |                                                    | J. Am. Chem             | n. <u>Soc</u> . 1930, <u>52</u> , 68 - 80. |
| VARIABLES:                   | <del></del>                                        | PREPARED BY:            |                                            |
| T/K:<br>P/kPa:               | 283.15 - 310.15<br>101.325 (1 atm)                 |                         | P. L. Long                                 |
|                              |                                                    |                         |                                            |
| EXPERIMENTAL VALUE           | :S :                                               |                         |                                            |
|                              | T/K Mol Fraction                                   | Bunsen                  | Ostwald                                    |
| I                            | $x_{1} \times 10^{4}$                              | Coefficient             | Coefficient                                |
| I                            | 283.15 0.913                                       | 2.33                    | 2.42                                       |
|                              | 283.15 0.936                                       | 2.39                    | 2.48                                       |
| 1                            |                                                    | 2.69                    | 2.89                                       |
|                              | 310.15 1.35                                        | 3.33                    | 3.78                                       |
|                              | 310.15 1.33                                        | 3.28                    | 3.72                                       |
| Smoothed Data:               | $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$   | x <sub>1</sub> = 10,010 | + 41.860 T                                 |
|                              | Std. Dev. ∆G° = 24.2,                              | Coef. Corr              | . = 0.9989                                 |
|                              |                                                    |                         |                                            |
| For the recommof the solubil | ended Gibbs free energy<br>ity of neon in benzene. | equation se             | e the critical evaluation                  |
| The solubility               | values were adjusted to                            | o a partial             | pressure of neon of                        |
| 101.325 kPa (1               | atm) by Henry's law.                               |                         | · · · · ·                                  |
| The mole fract               | ion solubility and the                             | Ostwald coef            | ficients were calculated                   |
| by the compile               | r.                                                 |                         |                                            |
|                              |                                                    |                         |                                            |
|                              |                                                    |                         |                                            |
|                              | AIIXTLTARY                                         | INFORMATION             |                                            |
| METHOD                       |                                                    | SOURCE AND DU           | DITY OF MATERIALS.                         |
| Gas absorption               | . The gas is presatu-                              | I Neon                  | Linde's Liquid Air Fac-                    |
| rated with solv              | vent vapor. The gas                                | tory.                   | Contained one percent by                   |
| volume absorbe               | d is the difference                                | volume                  | e helium.                                  |
| umes. The amo                | unt of solvent is deter                            | 2. Benzen               | e. Kahlbaum's "Zur Mole-                   |
| mined by the we              | eight of mercury dis-                              | kularg                  | ewitchtsbestimmung",                       |
| placed.                      |                                                    | m.p. 5                  | .48°C.                                     |
|                              |                                                    |                         |                                            |
|                              |                                                    |                         |                                            |
|                              |                                                    |                         |                                            |
| APPARATUS / PROCEDUR         | E: The apparatus is a                              | ESTIMATED ERR           | OR:                                        |
| modification of              | f that of von Antropoff                            | т/                      | K = 0.03                                   |
| (1). A calibra               | ated, combined all glass                           | 3                       |                                            |
| manometer and l              | Sulb is enclosed in an Amercury is used as         |                         |                                            |
| the calibration              | n and confining liquid.                            | REFERENCES:             |                                            |
| The solvent is               | degassed in the appa-                              | 1. v. Ant               | ropoff, A.                                 |
| shaken togethe               | r until equilibrium is                             | <u>2. FIG</u>           | <u>cerocnem</u> . 1919, <u>25</u> , 269.   |
| established.                 |                                                    |                         |                                            |
|                              |                                                    |                         |                                            |
|                              |                                                    |                         |                                            |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. 2. Benzene; C<sub>6</sub>H<sub>6</sub>; 71-43-2 J. Phys. Chem. 1957, <u>61</u>, 1078 - 1083. VARIABLES: PREPARED BY: т/к: 287.15 - 312.15 P. L. Long EXPERIMENTAL VALUES: T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $X_1 \times 10^4$  $\alpha \times 10^2$ L x 10<sup>2</sup> 287.15 0.95 2.41 2.53 298.35 1.07 2.68 2.93 312.15 1.43 3.53 4.03 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 12,400 + 34.049 T$ Std. Dev.  $\Delta G^{\circ} = 104$ , Coef. Corr. = 0.9715 For the recommended free energy equation see the critical evaluation of the solubility of neon in benzene. The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat-SOURCE AND PURITY OF MATERIALS: urated with gas as it flows through 1. Neon. Matheson Co. Both rean 8 mm x 180 cm glass spiral attachsearch and standard grades were ed to a gas buret. The total presused with no difference in resure is maintained at 1 atm as the sults. gas is absorbed. Benzene. Jones and Laughlin Steel Co. Shaken with conc. 2. H<sub>2</sub>SO<sub>4</sub>, washed, dried over sodium, distilled ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and  $\delta T/K = 0.05$ Billett (1). The modifications in- $\delta P/torr = 3$  $\delta x_1 / x_1 = 0.03$ clude the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an REFERENCES: Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819. extra buret for highly soluble gases. 1. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). Baldwin, R. R.; Daniel, S. G. 2. J. Appl. Chem. 1952, 2, 161.

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                                                                                                                                                   |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1 Neon: Net $7440-01-9$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | de wet w J                                                                                                                                                                                                                                                                                                                                                                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                          |  |
| 2. Benzene; $C_{6}H_{6}$ ; /1-43-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | J. <u>S. Afr. Chem. Inst.</u> 1964, 17,                                                                                                                                                                                                                                                                                                                                                  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <u>9</u> – 13.                                                                                                                                                                                                                                                                                                                                                                           |  |
| $m/v_{2} = 203 45 - 204 25$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | P I Iong                                                                                                                                                                                                                                                                                                                                                                                 |  |
| P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | r. h. hong                                                                                                                                                                                                                                                                                                                                                                               |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                    |  |
| T/K Mol Fraction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Bunsen Ostwald                                                                                                                                                                                                                                                                                                                                                                           |  |
| -,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Coefficient Coefficient                                                                                                                                                                                                                                                                                                                                                                  |  |
| $\frac{1}{201.45}$ $\frac{1}{1.07}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                          |  |
| 291.45 1.07<br>298.95 1.17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2.70 2.88<br>2.92 3.20                                                                                                                                                                                                                                                                                                                                                                   |  |
| 304.35 1.23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.07 3.42                                                                                                                                                                                                                                                                                                                                                                                |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | W = 0000 0 + 40 505 T                                                                                                                                                                                                                                                                                                                                                                    |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | $x_1 = 8003.8 + 48.537 \text{ T}$                                                                                                                                                                                                                                                                                                                                                        |  |
| Std. Dev. $\Delta G^{\circ} = 9.8$ ,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Coef. Corr. = 0.9995                                                                                                                                                                                                                                                                                                                                                                     |  |
| For the recommended free energy equats solubility of neon in benzene.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ion see the critical evaluation of the                                                                                                                                                                                                                                                                                                                                                   |  |
| The solubility values were adjusted to a partial pressure of neon of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                          |  |
| TOI.325 KPa (I atm) by Henry's law.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                          |  |
| The mole fraction solubility and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Ostwald coefficients were calculated                                                                                                                                                                                                                                                                                                                                                     |  |
| The mole fraction solubility and the (by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ostwald coefficients were calculated .                                                                                                                                                                                                                                                                                                                                                   |  |
| The mole fraction solubility and the (by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ostwald coefficients were calculated .                                                                                                                                                                                                                                                                                                                                                   |  |
| The mole fraction solubility and the (by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ostwald coefficients were calculated .                                                                                                                                                                                                                                                                                                                                                   |  |
| The mole fraction solubility and the (by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ostwald coefficients were calculated .                                                                                                                                                                                                                                                                                                                                                   |  |
| The mole fraction solubility and the (by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ostwald coefficients were calculated .                                                                                                                                                                                                                                                                                                                                                   |  |
| The mole fraction solubility and the oby the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ostwald coefficients were calculated .                                                                                                                                                                                                                                                                                                                                                   |  |
| The mole fraction solubility and the oby the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Dstwald coefficients were calculated                                                                                                                                                                                                                                                                                                                                                     |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dostwald coefficients were calculated                                                                                                                                                                                                                                                                                                                                                    |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | INFORMATION<br>SOURCE AND PURITY OF MATERIALS;<br>1. Neon. No source given. The gas<br>purified over activated charcoal                                                                                                                                                                                                                                                                  |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less                                                                                                                                                                                               |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.                                                                                                                                                                          |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.<br>2. Benzene. No source given. Ben-                                                                                                                                     |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas.<br>The volume of                                                                                                                                                                                                                                                                                                                                                                                                  | Destwald coefficients were calculated          INFORMATION         SOURCE AND PURITY OF MATERIALS:         1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.         2. Benzene. No source given. Ben-<br>zene distilled immediately before<br>use                           |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-                                                                                                                                                                                                                                                                                                                                                               | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.<br>2. Benzene. No source given. Ben-<br>zene distilled immediately before<br>use.                                                                                        |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.                                                                                                                                                                                                                                                                                                                                       | Destwald coefficients were calculated          INFORMATION         SOURCE AND PURITY OF MATERIALS:         1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.         2. Benzene. No source given. Ben-<br>zene distilled immediately before<br>use.                          |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.                                                                                                                                                                                                                                                                                                                                       | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.<br>2. Benzene. No source given. Ben-<br>zene distilled immediately before<br>use.                                                                                        |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>qontaining the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.<br>APPARATUS/PROCEDURE:                                                                                                                                                                                                                                                                                                               | Destwald coefficients were calculated          INFORMATION         SOURCE AND PURITY OF MATERIALS:         1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.         2. Benzene. No source given. Ben-<br>zene distilled immediately before<br>use.         ESTIMATED ERROR: |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1)                                                                                                                                                                                                                                | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. No source given. The gas purified over activated charcoal at liquid air temperature. Im- purities estimated to be less than 0.3 percent. 2. Benzene. No source given. Ben- zene distilled immediately before use. ESTIMATED ERROR:</pre>                                                                                       |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1)<br>and others (2). The degassed solvent<br>is saturated with cas as it flowed                                                                                                                                                  | <pre>Destwald coefficients were calculated INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. No source given. The gas     purified over activated charcoal     at liquid air temperature. Im-     purities estimated to be less     than 0.3 percent. 2. Benzene. No source given. Ben-     zene distilled immediately before     use. ESTIMATED ERROR:</pre>                         |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1)<br>and others (2). The degassed solvent<br>is saturated with gas as it flows<br>through a glass spiral containing the                                                                                                          | <pre>Destwald coefficients were calculated INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. No source given. The gas purified over activated charcoal at liquid air temperature. Im- purities estimated to be less than 0.3 percent. 2. Benzene. No source given. Ben- zene distilled immediately before use. ESTIMATED ERROR:</pre>                                                 |  |
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| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>qontaining the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1)<br>and others (2). The degassed solvent<br>is saturated with gas as it flows<br>through a glass spiral containing the<br>gas. The amount of solvent passed<br>through the spiral is such that<br>10-25 ml of gas was absorbed. | <pre>Destwald coefficients were calculated INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. No source given. The gas     purified over activated charcoal     at liquid air temperature. Im-     purities estimated to be less     than 0.3 percent. 2. Benzene. No source given. Ben-     zene distilled immediately before     use. ESTIMATED ERROR:</pre>                         |  |
| The mole fraction solubility and the oby the compiler.<br>AUXILIARY<br>METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1)<br>and others (2). The degassed solvent<br>is saturated with gas as it flows<br>through a glass spiral containing the<br>gas. The amount of solvent passed<br>through the spiral is such that<br>10-25 ml of gas was absorbed. | <pre>Destwald coefficients were calculated<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. No source given. The gas<br/>purified over activated charcoal<br/>at liquid air temperature. Im-<br/>purities estimated to be less<br/>than 0.3 percent.<br/>2. Benzene. No source given. Ben-<br/>zene distilled immediately before<br/>use.<br/>ESTIMATED ERROR:</pre>     |  |

| COMPONENTS:                                                                                                                                                                                                                                                                     | EVALUATOR:                                    |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                          | H. L. Clever                                  |  |
|                                                                                                                                                                                                                                                                                 | Chemistry Department                          |  |
| 108-88-3                                                                                                                                                                                                                                                                        | Emory University<br>Atlanta, Georgia 30322    |  |
|                                                                                                                                                                                                                                                                                 | U.S.A.                                        |  |
|                                                                                                                                                                                                                                                                                 | March 1979                                    |  |
|                                                                                                                                                                                                                                                                                 |                                               |  |
| CRITICAL EVALUATION:                                                                                                                                                                                                                                                            |                                               |  |
| The solubility of neon in methylbenzene was measured by Saylor and Battino (1) and by de Wet (2).                                                                                                                                                                               |                                               |  |
| Each data set was smoothed by the method of least squares to a Gibbs<br>energy equation linear in temperature. The de Wet smoothed solubility<br>values ranged from 2 percent higher at 288.15 to 12 percent higher at<br>308.15 K than the Saylor and Battino smoothed values. |                                               |  |
| The seven solubility values from the two laboratories were combined<br>to obtain the recommended equation. No point fell as much as two standard<br>deviations from the method of least squares fit toa Gibbs energy equation<br>linear in temperature.                         |                                               |  |
| The recommended thermodynamic values for the transfer of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are                                                                                                                           |                                               |  |
| $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 7$                                                                                                                                                                                                                        | ,767.3 + 47.522 T                             |  |
| Std. Dev. $\Delta G^{\circ} = 69$ , Coef.                                                                                                                                                                                                                                       | Corr. = 0.9943                                |  |
| ΔH°/J mol <sup>-l</sup> = 7,767.3, ΔS°/J                                                                                                                                                                                                                                        | $K^{-1} mol^{-1} = -47.522$                   |  |
| The recommended values of the mole fraction solubility at 101.325 kPa<br>and the Gibbs energy of solution are given as a function of temperature<br>in Table 1.                                                                                                                 |                                               |  |
| TABLE 1. Solubility of neon in methylbenzene at 101.325 kPa. Recommended<br>mole fraction solubility and Gibbs energy of solution as a func-<br>tion of temperature.                                                                                                            |                                               |  |
| T/K Mol Fract<br>X <sub>1</sub> x 10                                                                                                                                                                                                                                            | ion <sup>a</sup> ∆G°/J mol <sup>-⊥</sup><br>4 |  |
| 288.15 1.285                                                                                                                                                                                                                                                                    | 21,461                                        |  |
| 293.15 1.360                                                                                                                                                                                                                                                                    | 21,699                                        |  |
| 298.15 I.435<br>303.15 I.510                                                                                                                                                                                                                                                    | 22,173                                        |  |
| 308.15 1.590                                                                                                                                                                                                                                                                    | 22,411                                        |  |
| 313.15 1.670<br>318.15 1.750                                                                                                                                                                                                                                                    | 22,649                                        |  |
| 323.15 1.830                                                                                                                                                                                                                                                                    | 23,124                                        |  |
| 328.15 1.910                                                                                                                                                                                                                                                                    | 23,362                                        |  |
| a Values rounded to nearest 0.005 x 10 <sup>-4</sup> .                                                                                                                                                                                                                          |                                               |  |
| <ol> <li>Saylor, J. H.; Battino, R. J. Phys. Chem. 1958, 62, 1334.</li> <li>de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.</li> </ol>                                                                                                                                        |                                               |  |
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|                                                                                                                                                                                                                                                                                 |                                               |  |
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| COMPONENTS                                                                                                      |                                                                  |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| COMPONENTS:                                                                                                     | URIGINAL MEASUREMENTS:                                           |
| 1. Neon; Ne; 7440-01-9                                                                                          | Saylor, J. H.; Battino, R.                                       |
| 2. Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ;<br>108-88-3                                         |                                                                  |
|                                                                                                                 | <u>J. Phys. Chem</u> . 1958, <u>62</u> , 1334 - 1337.            |
| VARIABLES:                                                                                                      | PREPARED BY:                                                     |
| T/K: 288.15 - 328.15<br>P/kPa: 101.325 (1 atm)                                                                  | H. L. Clever                                                     |
| EXPERIMENTAL VALUES:                                                                                            |                                                                  |
| TTK Mol Eraction                                                                                                | Bunson Ostwald                                                   |
| $x_1 \times 10^4$                                                                                               | Coefficient Coefficient<br>$\alpha \times 10^2$ L $\times 10^2$  |
| $\frac{n_1 + 10}{288, 15}$                                                                                      | $\frac{2.66}{2.81}$                                              |
| 298.15 1.40                                                                                                     | 2.94 3.21                                                        |
| 313.15 1.62                                                                                                     | 3.35 3.84<br>3.89 4.67                                           |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$                                                        | $X_1 = 8,146.5 + 46.441 \text{ T}$                               |
| Std. Dev. ΔG° = 25.9,                                                                                           | Coef. Corr. = 0.9995                                             |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 8,146.5,$                                                                | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -46.441$                   |
| T/K Mol Fract<br>X1 x 10                                                                                        | ion ∆G°/J mol <sup>-⊥</sup>                                      |
| $\frac{1}{288.15}$ $\frac{1}{1.25}$                                                                             |                                                                  |
| 293.15 1.33                                                                                                     | 21,761                                                           |
|                                                                                                                 | 21,993                                                           |
| 308.15 1.56                                                                                                     | 22,457                                                           |
| 313.15 1.64                                                                                                     | 22,690                                                           |
| 318.15 $1.72323.15$ $1.81$                                                                                      | 23,154                                                           |
| 328.15 1.89                                                                                                     | 23,386                                                           |
| The solubility values were adjusted to<br>kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate | a partial pressure of neon of 101.325<br>d by the compiler.      |
|                                                                                                                 |                                                                  |
|                                                                                                                 |                                                                  |
| METHOD:Volumetric. The solvent is sat-                                                                          | SOURCE AND PURITY OF MATERIALS:                                  |
| an 8 mm x 180 cm glass spiral at-                                                                               | 1. Neon. Matheson Co., Inc.<br>Research grade.                   |
| tached to a gas buret. The total                                                                                |                                                                  |
| the gas is absorbed.                                                                                            | grade, Shaken over conc. H <sub>2</sub> SO4.                     |
|                                                                                                                 | water washed, dried over                                         |
|                                                                                                                 | Drierite, distilled b.p. 110.40 -                                |
|                                                                                                                 | 110.80 ° C.                                                      |
|                                                                                                                 |                                                                  |
|                                                                                                                 |                                                                  |
|                                                                                                                 | ESTIMATED ERROR:                                                 |
| arrakaTUS/PROCEDURE: The apparatus is a modification of that of Morrison and                                    | $\delta T/K = 0.03$                                              |
| Billett(1). The modifications in-                                                                               | $\delta P/torr = 1$                                              |
| clude the addition of a spiral stor-                                                                            | $\delta X_1 / X_1 = 0.04$                                        |
| a constant reference pressure, and an                                                                           | REFERENCES:                                                      |
| extra buret for highly soluble gases.                                                                           | 1. Morrison, T. J.; Billett, F.                                  |
| The solvent is degassed by a modifi-<br>cation of the method of Baldwin and                                     | ibid. 1952. 3819.                                                |
| Daniel (2).                                                                                                     |                                                                  |
|                                                                                                                 | 2. Baldwin, R. R.; Daniel, S. G.<br>J. Appl. Chem. 1952. 2. 161. |
|                                                                                                                 |                                                                  |

| COMPONENTS:                                                                                                                                                                                                         | ORIGINAL MEASUREMENTS:                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                              | de Wet, W. J.                                                                                                                                                                      |
| <ol> <li>Methylbenzene (Toluene); C<sub>7</sub>H<sub>8</sub>;<br/>108-88-3</li> </ol>                                                                                                                               |                                                                                                                                                                                    |
|                                                                                                                                                                                                                     | J. <u>S. Afr</u> . <u>Chem</u> . <u>Inst</u> . 1964, <u>17</u> ,<br>9 - 13.                                                                                                        |
| VARIABLES:                                                                                                                                                                                                          | PREPARED BY:                                                                                                                                                                       |
| T/K: 292.15 - 304.15<br>P/kPa: 101.325 (1 atm)                                                                                                                                                                      | P. L. Long                                                                                                                                                                         |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                |                                                                                                                                                                                    |
| T/K Mol Fraction                                                                                                                                                                                                    | Pungon Octuald                                                                                                                                                                     |
|                                                                                                                                                                                                                     | Coefficient Coefficient                                                                                                                                                            |
|                                                                                                                                                                                                                     | $\frac{\alpha \times 10^2}{1 \times 10^2}$                                                                                                                                         |
| 292.15 1.35                                                                                                                                                                                                         | 2.85 3.05                                                                                                                                                                          |
| 304.15 1.59                                                                                                                                                                                                         | 3.32 3.70                                                                                                                                                                          |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln I$                                                                                                                                                   | и X <sub>1</sub> = 10,115 + 39.447 т                                                                                                                                               |
| Std. Dev. $\Delta G^{\circ} = 8.0$ ,                                                                                                                                                                                | Coef. Corr. = 0.9994                                                                                                                                                               |
| For the recommended free energy equat<br>solubility of meon in toluene.<br>The solubility values were adjusted t<br>101.325 kPa (1 atm) by Henry's law.<br>The mole fraction solubility and the<br>by the compiler. | tion see the critical evaluation of the<br>to a partial pressure of neon of<br>Ostwald coefficients were calculated                                                                |
| AUXILIARY                                                                                                                                                                                                           | INFORMATION                                                                                                                                                                        |
| METHOD: Volumetric.                                                                                                                                                                                                 |                                                                                                                                                                                    |
| To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.                                                     | <ol> <li>Neon. No source given. The gas<br/>purified over activated charcoal<br/>at liquid air temperature. Im-<br/>purities estimated to be less<br/>than 0.3 percent.</li> </ol> |
| To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.                                      | <ol> <li>Toluene. No source given. Tolu-<br/>ene distilled immediately before<br/>use.</li> </ol>                                                                                  |
| APPARATUS/PROCEDURE:                                                                                                                                                                                                | ESTIMATED ERROR:                                                                                                                                                                   |
| The apparatus is a modification of<br>that used by Morrison and Billett (1)<br>and others (2). The degassed solvent                                                                                                 | $\delta T/K = 0.05$                                                                                                                                                                |
| is saturated with gas as it flows<br>through a glass spiral containing the<br>gas. The amount of solvent passed<br>through the spiral was such that<br>10-25 ml of gas was absorbed.                                | <pre>REFERENCES: 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; <u>Ibid.</u> 1952, 3819.</pre>                                                                          |
|                                                                                                                                                                                                                     | <ol> <li>Clever, H. L.; Battino, R.<br/>Saylor, J. H.; Gross, P. M.<br/>J. Phys. Chem. 1957, 61, 1078.</li> </ol>                                                                  |

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ORIGINAL MEASUREMENTS:                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Byrne, J.E.; Battino, R.;                                                                                                                                                                                    |
| <pre>2. 1,2-Dimethylbenzene (<u>o</u>-Xylene);<br/>C<sub>8</sub><sup>H</sup>10; 95-47-6</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WIINEIM, E.                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <u>J. Chem. Thermodyn</u> . 1975, <u>7</u> , 515-522.                                                                                                                                                        |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | PREPARED BY:                                                                                                                                                                                                 |
| T/K: 298.13 - 298.19<br>P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H.L. Clever                                                                                                                                                                                                  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                              |
| T/K MOL Fraction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Coefficient Coefficient                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | $\alpha \times 10^2$ L × $10^2$                                                                                                                                                                              |
| 298.13 1.412                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2.61 2.849                                                                                                                                                                                                   |
| 298.15 1.352<br>298.19 1.395                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2.50 2.729<br>2.58 2.816                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                              |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law. '<br>lated by the compiler.                                                                                                                                                                                                                                                                                                                                                                                                                                     | o a partial pressure of neon of<br>The Bunsen coefficients were calcu-                                                                                                                                       |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | INFORMATION                                                                                                                                                                                                  |
| APPARATUS / PROCEDURE :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | COUDCE AND DUDITY OF WATEDIALC.                                                                                                                                                                              |
| METHOD/APPARATOS/PROCEDURE:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm deep.<br>The liquid is rapidly stirred, and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns.<br>Solubility Determination. The de- | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp;    Chemicals,Inc., or Matheson Co.,    Inc. 99 mol % or better. 2. 1,2-Dimethylbenzene. Phillips    Petroleum Co. Pure grade. </pre> |
| gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas and the<br>solvent vapor at a total pressure of<br>one atm. The volume of gas absorbed                                                                                                                                                                                                                                                                                                                                                     | ESTIMATED ERROR:<br>$\begin{array}{rcl} & \delta T/K &= 0.03 \\ & \delta P/mmHg &= 0.5 \\ & \delta X_1/X_1 &= 0.02 \end{array}$                                                                              |
| is found by difference between the<br>initial and final volumes in the<br>buret system. The solvent is col-<br>lected in a tared flask and weighed.                                                                                                                                                                                                                                                                                                                                                                                           | REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033.                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ol> <li>Battino, R.; Evans, F.D.;<br/>Danforth, W.F.</li> <li><u>J. Am. Oil Chem. Soc</u>. 1968, <u>45</u>,<br/>830.</li> </ol>                                                                             |

| COMPONENTS:                                                                                                                | EVALUATOR:                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <ol> <li>Neon; Ne; 7440-01-9</li> <li>1,3-Dimethylbenzene (m-Xylene);<br/>C<sub>8</sub>H<sub>10</sub>; 108-38-3</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322 U.S.A.<br>USA |

The solubility of neon in 1,3-dimethylbenzene was measured in two laboratories. Three solubility values between 291.65 and 305.25 K were reported by de Wet (1),and two solubility values at 298.17 and 298.18 K were reported by Byrne, Battino, and Wilhelm (2).

The de Wet solubility values at 299.25 K and the average of the Byrne, Battino and Wilhelm values at 298.17 and 298.18 K fall within the expected experimental error of 3 per cent. All data points were combined on a one to one weight basis to obtain the recommended Gibbs energy equation linear in temperature by the method of least squares.

The recommended thermodynamic values for the transfer of one mole of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 \approx 10,187 + 38.421 T$ 

Std. Dev.  $\Delta G^{\circ} = 49$ , Coef. Corr. = 0.9670

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 10,187, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -38.421$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes at five degree intervals between 288.15 and 308.15 K are given in Table 1.

TABLE 1. Solubility of neon in 1,3-dimethylbenzene. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| Т/К    | Mol Fraction <sup>a</sup> $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|---------------------------------------------|-------------------------|
| 288.15 | 1.400                                       | 21,259                  |
| 293.15 | 1.505                                       | 21,451                  |
| 298.15 | 1.615                                       | 21,643                  |
| 303.15 | 1.730                                       | 21,835                  |
| 308.15 | 1.845                                       | 22,027                  |

<sup>a</sup> rounded to the nearest  $0.005 \times 10^{-4}$ .

de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.
 Byrne, J. E.; Battino, R.; Wilhelm, E. J. Chem. Thermodyn. 1975, 7, 515.

|                                                                                 | · · · · · · · · · · · · · · · · · · ·                                       |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| COMPONENTS:                                                                     | ORIGINAL MEASUREMENTS:                                                      |
| 1. Neon; Ne; 7440-01-9                                                          | de Wet, W. J.                                                               |
| 2. 1,3-Dimethylbenzene (m-Xylene);<br>C <sub>8</sub> H <sub>10</sub> ; 108-38-3 |                                                                             |
|                                                                                 | J. <u>S. Afr</u> . <u>Chem</u> . <u>Inst</u> . 1964, <u>17</u> ,<br>9 - 13. |
| VARIABLES:                                                                      | PREPARED BY:                                                                |
| T/K: 291.65 - 305.25<br>P/kPa: 101.325 (1 atm)                                  | P. L. Long                                                                  |
| EXPERIMENTAL VALUES:                                                            |                                                                             |
| T/K Mol Fraction                                                                | Bunsen Ostwald                                                              |
| $x_1 \times 10^4$                                                               | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$                  |
| $\frac{1}{291.65}$ $\frac{1}{1.47}$                                             | 2.69 2.87                                                                   |
| 299.25 1.66                                                                     | 3.01 3.30                                                                   |
|                                                                                 |                                                                             |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT$ In                          | $X_1 = 10,161 + 38.493 \text{ T}$                                           |
| Std. Dev. ΔG° = 22.5,                                                           | Coef. Corr. = 0.9963                                                        |
| For the recommended free energy equat solubility of neon in <u>m</u> -xylene.   | ion see the critical evaluation of the                                      |
| The solubility values were adjusted t<br>101.325 kPa (l atm) by Henry's law.    | o a partial pressure of neon of                                             |
| The mole fraction solubility and the                                            | Ostwald coefficients were calculated                                        |
| by the compiler.                                                                |                                                                             |
|                                                                                 |                                                                             |
|                                                                                 |                                                                             |
|                                                                                 |                                                                             |
|                                                                                 |                                                                             |
|                                                                                 |                                                                             |
| AUXILIARY                                                                       | INFORMATION                                                                 |
| METHOD: Volumetric.                                                             | SOURCE AND PURITY OF MATERIALS:                                             |
| To degas, the solvent is placed in<br>a large continuously evacuated bulb       | 1. Neon. No source given. The gas                                           |
| until the solvent boils freely with-                                            | at liquid air temperature. Im-                                              |
| out further release of dissolved gases.                                         | purifies estimated to be less<br>than 0.3 percent.                          |
| The appropriate the column is flowed in                                         | $2 - \frac{1}{2}$                                                           |
| a thin film through a glass spiral                                              | m-Xylene distilled immediately                                              |
| containing the gas. The volume of gas absorbed is measured on an at-            | before use.                                                                 |
| tached buret system.                                                            |                                                                             |
|                                                                                 | FCTIMATED EDDOD.                                                            |
| APPARATUS/PROCEDURE:                                                            | $\delta \pi / \kappa = 0.05$                                                |
| that used by Morrison and Billett (1)                                           | 017K - 0.05                                                                 |
| and others (2). The degassed solvent is saturated with gas as it flows          |                                                                             |
| through a glass spiral containing the                                           | REFERENCES:                                                                 |
| gas. The amount of solvent passed through the spiral was such that              | J. Chem. Soc. 1948, 2033;                                                   |
| 10-25 ml of gas was absorbed.                                                   | <u>ibid. 1952,</u> 3819.                                                    |
|                                                                                 | 2. Clever, H. L.; Battino, R.;                                              |
|                                                                                 | Saylor, J. H.; Gross, P. M.<br>J. Phys. Chom. 1957, 61, 1079                |
|                                                                                 | <u><u><u></u></u>. <u>rnys</u>. <u>cnem</u>. 1957, <u>ot</u>, 1078.</u>     |

| COMPONENTS:                                                                                | ORIGINAL MEASUREMENTS:                                                                                                                                                    |  |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| l. Neon; Ne; 7440-01-9                                                                     | Byrne, J. E.; Battino, R.;<br>Wilhelm F                                                                                                                                   |  |
| 2. 1,3-Dimethylbenzene (m-Xylene);<br>C <sub>8</sub> H <sub>10</sub> ; 108-38-3            | ······································                                                                                                                                    |  |
|                                                                                            | J. Chem. Thermodyn, 1975, 7, 515-522,                                                                                                                                     |  |
| VARIABLES:                                                                                 | PREPARED BY:                                                                                                                                                              |  |
| т/к: 298.17 - 298.18                                                                       |                                                                                                                                                                           |  |
| P/kPa: 101.325 (1 atm)                                                                     | H. L. Clever                                                                                                                                                              |  |
| EXPERIMENTAL VALUES:                                                                       |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
| $x_1 \times 10^4$                                                                          | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$                                                                                                                |  |
| 298.17 1.654                                                                               | 3.00 3.277                                                                                                                                                                |  |
| 298.18 1.570                                                                               | 2.85 3.109                                                                                                                                                                |  |
| The Bunsen coefficients were calculat                                                      | ed by the compiler.                                                                                                                                                       |  |
| The solubility values were adjusted t                                                      | o neon partial pressure of 101.325 kPa                                                                                                                                    |  |
| (1 atm) by Henry's law.                                                                    |                                                                                                                                                                           |  |
| See the evaluation of neon + 1,3-dime                                                      | thylbenzene for the recommended Gibbs                                                                                                                                     |  |
| energy equation and smoothed values o                                                      | f solubility.                                                                                                                                                             |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
|                                                                                            |                                                                                                                                                                           |  |
| AUXILIARY                                                                                  | INFORMATION                                                                                                                                                               |  |
| METHOD: The apparatus is based on the                                                      | SOURCE AND PURITY OF MATERIALS:                                                                                                                                           |  |
| and the version used is described by                                                       | 1. Neon. Either Air Products and<br>Chemicals, Inc. or Matheson Co.                                                                                                       |  |
| Battino, Evans, and Danforth (2).                                                          | Inc. 99 mole % or better.                                                                                                                                                 |  |
|                                                                                            | 2. m-Xylene. Phillips Petroleum                                                                                                                                           |  |
|                                                                                            | Co., pure grade.                                                                                                                                                          |  |
|                                                                                            |                                                                                                                                                                           |  |
| to 500 cm <sup>3</sup> of solvent is placed in a                                           |                                                                                                                                                                           |  |
| flask of such size that the liquid is about 4 cm deep. The liquid is rapid-                |                                                                                                                                                                           |  |
| ly stirred and vacuum is applied in-                                                       | ESTIMATED ERROR:                                                                                                                                                          |  |
| termittently through a liquid N <sub>2</sub> trap<br>until the permanent gas residual      | $\delta T/K = 0.03$                                                                                                                                                       |  |
| pressure drops to 5 microns.                                                               | $\delta P / mmHg = 0.5$<br>$\delta X_1 / X_1 = 0.02$                                                                                                                      |  |
| SOLUDILITY Determination. The degassed solvent passes in thin film                         |                                                                                                                                                                           |  |
| down a glass spiral at a total pres-                                                       | REFERENCES:                                                                                                                                                               |  |
| sure of one atm of solute gas plus solvent vapor. Solubility equilibrium                   |                                                                                                                                                                           |  |
| is wantidly attained whe welves of                                                         | 1. Morrison, T. J.; Billett, F.                                                                                                                                           |  |
| as absorbed is measured and the                                                            | <ol> <li>Morrison, T. J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033.</li> </ol>                                                                                            |  |
| gas absorbed is measured, and the solvent is collected in a tared                          | <ol> <li>Morrison, T. J.; Billett, F.<br/>J. <u>Chem.</u> <u>Soc</u>. 1948, 2033.</li> <li>Battino, R.; Evans, F. D.;</li> </ol>                                          |  |
| gas absorbed is measured, and the<br>solvent is collected in a tared<br>flask and weighed. | <ol> <li>Morrison, T. J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033.</li> <li>Battino, R.; Evans, F. D.;<br/>Danforth, W. F.<br/>J. Am. Oil Chem. Soc. 1968, 45</li> </ol> |  |

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                   |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <ol> <li>Neon; Ne; 7440-01-9</li> <li>1,4-Dimethylbenzene (p-Xylene);<br/>C<sub>0</sub>H<sub>10</sub>; 106-42-3</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                            | Byrne, J.E.; Battino, R.:<br>Wilhelm, E.                                                                                                                                                                                 |  |
| 8 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <u>J. Chem. Thermodyn</u> . 1975, <u>7</u> , 515-522.                                                                                                                                                                    |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | DDEDADED DV.                                                                                                                                                                                                             |  |
| T/K: 298.12 - 298.21<br>P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | H.L. Clever                                                                                                                                                                                                              |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                          |  |
| T/K Mol Fraction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Bunsen Ostwald                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Coefficient Coefficient                                                                                                                                                                                                  |  |
| $x_1 \times 10^4$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | $\alpha \times 10^2$ L × $10^2$                                                                                                                                                                                          |  |
| 298.121.563298.161.528298.171.524298.211.553                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2.83 3.085<br>2.76 3.016<br>2.76 3.008<br>2.81 3.066                                                                                                                                                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | INFORMATION                                                                                                                                                                                                              |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the<br>design by Morrison and Billett (1)'<br>and the version used is described by<br>Battino, Evans, and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Either Air Products &amp;    Chemicals, Inc., or Matheson Co.,    Inc. 99 mol % or better. 2. 1,4 Dimethylbenzene. Phillips    Petroleum Co. Pure grade.</pre> |  |

| COMPONENTS:<br>1. Neon; Ne; 7440-01-9                       |                                                 | ORIGINAL MEASUREMENTS:<br>Lannung, A.                         |  |
|-------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------|--|
| 2. Methanol (Methyl Alcohol); CH <sub>4</sub> O;<br>67-56-1 |                                                 |                                                               |  |
|                                                             |                                                 | <u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68-80.            |  |
| VARIABLES: T/K:                                             | 288.15 - 310.15                                 | PREPARED BY:                                                  |  |
| Ne P/kPa:                                                   | 101.325 (1 atm)                                 | P.L. Long                                                     |  |
| EXPERIMENTAL VALUES                                         | S:                                              |                                                               |  |
|                                                             | T/K Mol Fraction                                | Bunsen Ostwald<br>Coefficient Coefficient                     |  |
|                                                             | $x_1 \times 10^4$                               | $\frac{\alpha \times 10^2}{2} \qquad \frac{L \times 10^2}{2}$ |  |
|                                                             | 288.15 0.742                                    | 4.13 4.36                                                     |  |
|                                                             | 293.15 0.780                                    | 4.28 4.59                                                     |  |
|                                                             | 303.15 0.841                                    | 4.60 5.11                                                     |  |
|                                                             | 310.15 0.881                                    | 4.78 5.43                                                     |  |
| Smoothed Data:                                              | $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln$    | Х <sub>1</sub> = 5,781.5 + 58.970 т                           |  |
|                                                             | Std. Dev. $\Delta G^{O} = 10.1$ ,               | Coef. Corr. = 0.9998                                          |  |
|                                                             | $\Delta H^{O}/J \text{ mol}^{-1} = 5,781.5$     | $\Delta S^{0}/J K^{-1} mol^{-1} = -58.970$                    |  |
|                                                             | T/K Mol Fra                                     | ction $\Delta G^{O}/J \text{ mol}^{-1}$                       |  |
|                                                             | XX                                              | 104                                                           |  |
|                                                             | 288.15 0.7                                      | 22774                                                         |  |
| 1                                                           |                                                 | 775 23068<br>307 23363                                        |  |
|                                                             | 303.15 0.8                                      | 23658                                                         |  |
|                                                             | 308.15 0.8<br>313.15 0.9                        | 370 23953<br>302 24248                                        |  |
| The mole fracti                                             | on solubility and the (                         | stwald coefficients were calculated                           |  |
| by the compiler                                             | setward coefficients were calculated            |                                                               |  |
| 1                                                           |                                                 |                                                               |  |
|                                                             | AUXILIARY                                       | INFORMATION                                                   |  |
| METHOD:                                                     | on The cas is pro-                              | SOURCE AND PURITY OF MATERIALS:                               |  |
| saturated with                                              | solvent vapor. The gas                          | Factory. Contained 1 per cent                                 |  |
| volume absorbed                                             | is the difference be-                           | by volume of helium.                                          |  |
| The amount of s                                             | olvent is determined by                         | 2. Methanol. B.A.S.F. Distilled                               |  |
| the weight of m                                             | ercury displaced.                               | from freshly cut magnesium                                    |  |
|                                                             |                                                 | rejected.                                                     |  |
|                                                             |                                                 |                                                               |  |
|                                                             |                                                 |                                                               |  |
|                                                             |                                                 | ESTIMATED ERROR:                                              |  |
| APPARATUS/PROCEDUR                                          | E:                                              |                                                               |  |
| The apparatu                                                | s is a modification of ropoff (1). A cali-      | $\delta T/K = 0.03$                                           |  |
| brated, combine                                             | d all glass manometer                           | J                                                             |  |
| and bulb is enc                                             | losed in an air thermo-<br>is used as the cali- | REFERENCES :                                                  |  |
| bration and con                                             | fining liquid. The                              | 1. v. Antropoff, A.                                           |  |
| solvent is dega                                             | ssed in the apparatus.                          | <u>Z</u> . <u>Electrochem</u> . 1919, <u>25</u> , 269.        |  |
| together until equilibrium is                               |                                                 |                                                               |  |
| established.                                                |                                                 |                                                               |  |
|                                                             |                                                 |                                                               |  |

| COMPONENTS:                                                             | EVALUATOR:                                                                              |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| l. Neon; Ne; 7440-01-9                                                  | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, GA 30322<br>U.S.A. |
| 2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5 |                                                                                         |
|                                                                         | April 1978                                                                              |

The solubility of neon in ethanol was measured by Lannung (1) and by Krestov and Patsatsiya (2).

The Krestov and Patsatsiya data were reported as absorption coefficients which were equivalent to Bunsen coefficients at a gas partial pressure of (760-solvent vapor pressure) mmHg. The Krestov and Patsatsiya data were recalculated as mole fraction solubilities at 101.325 kPa (1 atm) assuming that the gas is ideal and that Henry's law is obeyed.

The mole fraction solubilities from each laboratory were smoothed by the method of least squares to a Gibbs energy function linear in tempera-ture. The smoothed solubility values from the two laboratories agree within 2.0 per cent at 288.15 K and 1.6 per cent at 313.15 K. The agree-ment is well within the expected experimental error. All of the solubility values from both laboratories were used on a one to one weight basis to obtain the recommended Gibbs energy equation linear in temperature by the method of least squares.

The recommended thermodynamic values for the transfer of one mole of neon gas at 101.325 kPa to the hypothetical unit mole fraction solution are

> $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 6,123.8 + 55.307 T$ Std. Dev. ∆G° = 46.6, Coef. Corr. = 0.9963

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,123.8, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -55.307$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes between 283.15 and 313.15 K are given in Table 1.

TABLE 1. Solubility of neon in ethanol. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| т/к    | Mol Fraction <sup>a</sup><br>X <sub>l</sub> x 10 <sup>4</sup> | ∆G°/J mol <sup>-1</sup> |
|--------|---------------------------------------------------------------|-------------------------|
| 283.15 | 0.960                                                         | 21,784                  |
| 288.15 | 1.000                                                         | 22,061                  |
| 293.15 | 1.045                                                         | 22,337                  |
| 298.15 | 1.090                                                         | 22,614                  |
| 303.15 | 1.135                                                         | 22,890                  |
| 308.15 | 1.185                                                         | 23,167                  |
| 313.15 | 1.230                                                         | 23,443                  |

<sup>a</sup> Rounded to the nearest 0.005 x  $10^{-4}$ 

1.

Lannung, A. J. Am. Chem. Soc. 1930, <u>52</u>, 68. Krestov, G. A.; Patsatsiya, K. M. <u>Izv</u>. <u>Vyssh</u>. <u>Uchebn</u>. <u>Zaved</u>., <u>Khim</u>. 2. Khim. Tekhnol. 1969, 12, 1333.

| COMPONENTS:                                                             |                                     |                                                       | ORIGINAL MEASUREMENTS:                                                       |
|-------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                  |                                     |                                                       | Lannung, A.                                                                  |
| 2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5 |                                     |                                                       |                                                                              |
|                                                                         |                                     |                                                       | J. Am. Chem. Soc. 1930, 52, 68-80.                                           |
| VARIABLES:                                                              |                                     |                                                       | PREPARED BY:                                                                 |
| <b>Т/К:</b>                                                             | 288.15 - 31                         | 0.15                                                  | P.L. Long                                                                    |
| Ne P/kPa:                                                               | 101.325 (1                          | atm)                                                  |                                                                              |
| EXPERIMENTAL VALUE                                                      | S:                                  |                                                       |                                                                              |
|                                                                         | Т/К Мо                              | l Fraction<br>X, x 10 <sup>4</sup>                    | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$ |
|                                                                         |                                     |                                                       | 2.01 4.02                                                                    |
|                                                                         | 288.15                              | 0.987                                                 | 3.81 4.02<br>3.80 4.01                                                       |
|                                                                         | 293.15                              | 1.04                                                  | 3.98 4.27                                                                    |
|                                                                         | 293.15                              | 1.09                                                  | 4.07 4.37<br>4.17 4.55                                                       |
|                                                                         | 310.15                              | 1.18                                                  | 4.43 5.03                                                                    |
| Smoothed Data:                                                          | ∆G <sup>O</sup> /J mol <sup>-</sup> | 1 = - RT ln                                           | х <sub>1</sub> = 5992.0 + 55.820 т                                           |
|                                                                         | Std. Dev.                           | $\Delta G^{O} = 29.2, 0$                              | Coef. Corr. = $0.9980$                                                       |
|                                                                         |                                     | - 5552.0,                                             |                                                                              |
|                                                                         | T,                                  | /K Mol Fra<br>X <sub>l</sub> x 1                      | ction AG <sup>-</sup> /J mol <sup>-</sup>                                    |
|                                                                         | 288                                 | .15 0.9                                               | 96 22076                                                                     |
|                                                                         | 293<br>298                          | .15 $1.0$                                             | 4 22356<br>3 22635                                                           |
|                                                                         | 303                                 | .15 1.1                                               | 3 22914                                                                      |
|                                                                         | 308<br>313                          | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | 7 23193<br>2 23472                                                           |
| The mole fraction<br>by the compiler                                    | on solubili<br>•                    | ty and the O                                          | stwald coefficients were calculated                                          |
|                                                                         |                                     | AUXILIARY                                             | INFORMATION                                                                  |
|                                                                         |                                     |                                                       | CONDER AND DUDITY OF WATEDIALS.                                              |
| Gas absorption                                                          | on. The ga                          | s is pre-                                             | 1. Neon. Linde's Liquid Air                                                  |
| saturated with                                                          | solvent vap                         | or. The gas                                           | Factory. Contained 1 per cent                                                |
| volume absorbed<br>tween initial a                                      | is the dif<br>nd final ga           | ference be-<br>s volumes.                             | by volume of helium.                                                         |
| The amount of s                                                         | olvent is d                         | etermined by                                          | 2. Ethanol. Alcohol absolutus, Ph.                                           |
| the weight of m                                                         | ercury disp                         | laced.                                                | prepared calcium oxide.                                                      |
|                                                                         |                                     |                                                       |                                                                              |
|                                                                         |                                     |                                                       |                                                                              |
|                                                                         |                                     |                                                       |                                                                              |
|                                                                         |                                     |                                                       | FOTIMATED EDDOD.                                                             |
| APPARATUS/PROCEDURE:                                                    |                                     |                                                       | LOTHERID BROW                                                                |
| The apparatue<br>that of von Ant                                        | s is a modi:<br>ropoff (1).         | fication of<br>A cali-                                | $\delta T/K = 0.03$                                                          |
| brated, combined                                                        | d all glass                         | manometer                                             | -                                                                            |
| and bulb is enc.<br>stat. Mercury :                                     | losed in an<br>is used as           | air thermo-                                           | REFERENCES:                                                                  |
| bration and con                                                         | fining liqu                         | id. The                                               | 1. v. Antropoff, A.                                                          |
| solvent is dega<br>The solvent and                                      | ssed in the<br>the gas are          | apparatus.<br>e shaken                                | <u>z. Electrochem</u> . 1919, <u>25</u> , 269.                               |
| together until                                                          | equilibrium                         | is                                                    |                                                                              |
| estadlished.                                                            |                                     |                                                       |                                                                              |
|                                                                         |                                     |                                                       |                                                                              |

| COMPONENTS:                        |                      |                                     | ORIGI                | NAL MEASUREMENTS     | :                                    |                                               |            |
|------------------------------------|----------------------|-------------------------------------|----------------------|----------------------|--------------------------------------|-----------------------------------------------|------------|
| 1. Neon; Ne; 7440-01-9             |                      | Krestov, G.A.; Patsatsiya, K.M.     |                      |                      |                                      |                                               |            |
| 2. Ethanol (Ethyl Alcohol); C.H.O: |                      |                                     |                      |                      |                                      |                                               |            |
| 64-1                               | 7-5                  | -                                   | 2 6 7                | <b>.</b>             | March 11                             |                                               |            |
|                                    |                      |                                     |                      | $\frac{12V}{Khi\pi}$ | <u>vyssn. Ucheb</u><br>. Tekhnol. 19 | <u>n. Zaved., Khim.</u><br>69, 12, 1333 - 133 | 7.         |
|                                    |                      |                                     |                      |                      |                                      |                                               |            |
| VARIABLES                          | :                    |                                     |                      | PREPA                | ARED BY:                             |                                               |            |
|                                    | т/к: 2               | 83.15 -313.15                       |                      |                      | H. L.                                | Clever                                        |            |
|                                    |                      |                                     |                      |                      |                                      |                                               |            |
| EXPERIMEN                          | TAL VALUES           | :                                   |                      |                      |                                      |                                               |            |
| т/к                                | Neon                 | Bunsen                              | Calcul               | ated                 | Values for Ne                        | P/kPa = 101.325                               |            |
|                                    | P/mmHg               | Coefficient                         | (760 m               | mHg)                 | Dungan                               | 0.000                                         |            |
|                                    |                      | a x 10-                             | MOL FIAC             | tion                 | Coefficient                          | Coefficient                                   |            |
|                                    |                      |                                     | X1 x 1               | 04                   | α x 10 <sup>2</sup>                  | L x 10 <sup>2</sup>                           |            |
| 283.15                             | 736.0                | 3.726                               | 0.991                |                      | 3.848                                | 3,989                                         |            |
| 293.15                             | 715.4                | 3.772                               | 1.043                |                      | 4.007                                | 4.300                                         |            |
| 313.15                             | 625.0                | 3.906                               | 1.124                |                      | 4.271<br>4.750                       | 4.740                                         |            |
|                                    |                      |                                     |                      |                      |                                      |                                               |            |
| Smoothe                            | d Data:              | $\Delta G^{0}/J \text{ mol}^{-1} =$ | -RT ln X             | ן<br>1 = 5           | ,990.2 + 55.6                        | 58 T                                          |            |
|                                    |                      | Std Dev AC                          | = 56 0 00            | -<br>off             | Corr 0 9969                          |                                               |            |
|                                    |                      | blu. Dev. 16                        | - 50.0 CC            | Jerr.                |                                      |                                               |            |
|                                    |                      | For the recom                       | nended Gil           | obs e                | nergy equation                       | n see the page                                |            |
|                                    |                      | ethanol.                            |                      |                      | or the solubi                        | itty of meon in                               |            |
| The Fya                            | luator c             | alculated the                       | solubili             | tu va                | lues at a pre-                       | ssure of neon of                              |            |
| 101.325                            | kPa (76              | 0 mmHg). Ethar                      | nol vapor            | pres                 | sure and dens.                       | ity values were                               |            |
| taken f                            | rom Wilh             | oit and Zwolin                      | nski (2).            | The                  | neon partial                         | pressures in the                              | į          |
| 760 mmH                            | g.                   | e obtained by                       | Subtract             | ing t                | ne ethanoi vaj                       | por pressure from                             |            |
| Coo the                            | data ch              | act on the se                       | 1                    | <b>.</b>             | an in mintura                        | a of vistor 1 other                           | <b>~</b> 1 |
| for add                            | itional              | data from this                      | s paper.             | OL IIE               | on in mixture                        | s or water + ethan                            | 101        |
|                                    |                      |                                     |                      |                      |                                      |                                               |            |
|                                    |                      |                                     | AUXILIARY            | INFOR                | ΜΔΤΤΩΝ                               |                                               |            |
|                                    |                      |                                     | AUAILIANI            | Infor                | MATION                               |                                               |            |
| METHOD:                            |                      |                                     |                      | SOURC                | E AND PURITY OF                      | MATERIALS:                                    |            |
| The app                            | pparatus<br>aratus O | is a modifica<br>f Ben-Naim and     | ation of<br>Baer (1) |                      | No informat:                         | ion given.                                    |            |
| ene app                            | urucus o             | r ben narm und                      |                      | 1                    |                                      |                                               |            |
| The a                              | uthors la            | abel their sol                      | lubility             |                      |                                      |                                               |            |
| total p                            | ressure (            | on gas + solve                      | ent vapor            |                      |                                      |                                               |            |
| of one                             | atm. How             | ever, after re                      | ading                |                      |                                      |                                               |            |
| Evaluat                            | or is co             | nors other pap<br>nvinced that t    | these are            |                      |                                      |                                               |            |
| Bunsen                             | coeffici             | ents measured                       | at a gas             | 1                    |                                      |                                               |            |
| partial<br>vapor p                 | pressure)            | e of (760 - so<br>mmHq. They ar     | olvent<br>Te so      | í                    |                                      |                                               |            |
| treated                            | in the               | Table above.                        |                      | ESTIN                | ATED ERROR:                          |                                               |            |
|                                    |                      |                                     |                      | Í                    | δα/α                                 | x = 0.01 (Compiler)                           | )          |
|                                    |                      |                                     |                      |                      | - ,                                  |                                               |            |
|                                    |                      |                                     |                      |                      |                                      |                                               |            |
|                                    |                      |                                     |                      | REFE                 | RENCES:                              |                                               |            |
|                                    |                      |                                     |                      | 1. В<br>Т            | en-Naim, A.; l<br>rans. Faraday      | Baer, S.<br>Soc. 1963, 5 <u>9</u> , 273       | 35.        |
|                                    |                      |                                     |                      |                      | ilhoit P.G.                          | wolingti P.T                                  |            |
|                                    |                      |                                     |                      | 2. W<br>"P           | hysical and T                        | hermodynamic                                  |            |
|                                    |                      |                                     |                      | Р                    | roperties of A                       | Aliphatic Alcohols'                           | n          |
|                                    |                      |                                     |                      | A                    | merican Chemio                       | cal Society, 1973.                            | 1          |

| COMPONENTS:                                                          | ORIGINAL MEASUREMENTS:                                    |
|----------------------------------------------------------------------|-----------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                               | Battino, R.; Evans, F.D.;                                 |
| 2. 2-Methyl-1-propanol; C <sub>4</sub> H <sub>10</sub> O;<br>78-83-1 | Danforth, W.F.; Wilhelm, E.                               |
| 78-83-1                                                              | J Chem Thermodyn, 1971 3, 743-751                         |
|                                                                      | <u>o. ciiem. metmodyn</u> . 1971, <u>5</u> , 743-751.     |
| VARIABLES:                                                           | PREPARED BY:                                              |
| T/K: 274.07 - 312.77<br>P/kPa: 101.325 (1 atm)                       | H.L. Clever                                               |
|                                                                      |                                                           |
| EXPERIMENTAL VALUES:                                                 |                                                           |
| T/K Mol Fraction                                                     | Bunsen Ostwald<br>Coefficient Coefficient                 |
| $x_1 \times 10^4$                                                    | $\alpha \times 10^2$ L x $10^2$                           |
| 274.07 1.31                                                          | 3.23 3.24                                                 |
| 283.01 1.41                                                          | 3.45 3.57                                                 |
| 312.77 1.65                                                          | 3.92 4.49                                                 |
| Smoothed Data: $\Delta G^{\circ} = - RT \ln x_1 = 415$               | 51.4 + 59.127 T                                           |
| Std. Dev. $\Delta G^{O} = 15.5$ ,                                    | Coef. Corr. =0.9999                                       |
| $\Delta H^{O}/J \text{ mol}^{-1} = 4151.4,$                          | $\Delta S^{O}/J K^{-1} mol^{-1} = -59.127$                |
| T/K Mol Fra                                                          | action $\Delta G^{O}/J \text{ mol}^{-1}$                  |
| X, x                                                                 | 10 <sup>4</sup>                                           |
| $\frac{1}{273.15}$                                                   | 20302                                                     |
| 273.15 1.3                                                           | 35 20598                                                  |
| 283.15 1.4                                                           | 0 20893                                                   |
|                                                                      |                                                           |
|                                                                      | 53 21780                                                  |
| 303.15 1.5                                                           | 22076                                                     |
| 308.15 1.6                                                           | 22371                                                     |
| 313.15 1.6                                                           | 22667                                                     |
| 101.325 kPa (1 atm) by Henry's law.                                  | a partial pressure of neon of                             |
| The Bunsen coefficients were calculate                               | ed by the compiler.                                       |
| AUXILIARY                                                            | INFORMATION                                               |
| METHOD:                                                              | SOURCE AND PURITY OF MATERIALS:                           |
| A. Degasser (1). B. Absorption<br>of gas in a thin film of liquid    | l. Neon. The Matheson Co., Inc.<br>Greater than 99 mol %. |
|                                                                      | 2. 2-Methyl-l-propanol. Fisher                            |
| APPARATUS/PROCEDURE:                                                 | Scientific Co. Certified<br>(99 mol %).                   |
| Degassing. The solvent is sprayed                                    |                                                           |
| into an evacuated chamber of an all                                  |                                                           |
| glass apparatus; it is stirred and                                   |                                                           |
| the vapor pressure of the liquid.                                    |                                                           |
| Solubility Determination. The de-                                    |                                                           |
| gassed liquid passes in a thin film                                  | ESTIMATED ERROR:                                          |
| pressure of one atm of solute gas                                    | $\delta T/K = 0.03$                                       |
| plus solvent vapor. The gas absorbed                                 | $\delta P/mmHg = 0.5$ $\delta x / x = 0.015$              |
| is measured in the attached buret                                    |                                                           |
| in a tared flask and weighed.                                        | REFERENCES :                                              |
|                                                                      | 1. Battino, R.; Evans, D.F.                               |
|                                                                      | Anal. Chem. 1966, <u>38</u> , 1627.                       |
|                                                                      | J. Chem. Soc. 1948. 2033.                                 |
|                                                                      | 3. Clever, H.L.; Battino, R.;                             |
|                                                                      | Saylor, J.H.; Gross, P.M.                                 |
|                                                                      | <u>J. Pnys. Chem</u> . 1957, <u>61</u> , 1078.            |

| COMPONENTS:                                                                                                    | ORIGINAL MEASUREMENTS:                                                                   |  |  |
|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                         | Wilcock, R.J.; Battino, R.;<br>Danforth, W.F; Wilhelm, E.                                |  |  |
| 2. 1-Octanol; C <sub>8</sub> H <sub>18</sub> O; 111-87-5                                                       | <u>J.Chem.Thermodyn</u> . 1978, <u>10</u> , 817-822.                                     |  |  |
| VARIABLES :                                                                                                    | PREPARED RY.                                                                             |  |  |
| T/K: 298.08                                                                                                    |                                                                                          |  |  |
| P/kPa: 101.325 (1 atm)                                                                                         | A.L. Clamer                                                                              |  |  |
| EXPERIMENTAL VALUES:                                                                                           |                                                                                          |  |  |
| T/K Mol Fraction                                                                                               | Bunsen Ostwald                                                                           |  |  |
| $x_{1} \times 10^{4}$                                                                                          | $\alpha \times 10^2$ L x $10^2$                                                          |  |  |
| 298.08 1.693                                                                                                   | 2.397 2.616                                                                              |  |  |
| The solubility value was adjusted to a kPa by Henry's law.                                                     | partial pressure of neon of 101.325                                                      |  |  |
| The Bunsen coefficients were calculate                                                                         | d by the compiler.                                                                       |  |  |
| A preliminary report of the work appea                                                                         | ared in Conf. Int. Thermodyn. Chim.,                                                     |  |  |
|                                                                                                                |                                                                                          |  |  |
|                                                                                                                |                                                                                          |  |  |
|                                                                                                                |                                                                                          |  |  |
|                                                                                                                |                                                                                          |  |  |
|                                                                                                                |                                                                                          |  |  |
|                                                                                                                |                                                                                          |  |  |
|                                                                                                                |                                                                                          |  |  |
| AUXILIARY                                                                                                      | INFORMATION                                                                              |  |  |
| METHOD/APPARATUS/PROCEDURE:                                                                                    | SOURCE AND PURITY OF MATERIALS:                                                          |  |  |
| The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by | <ol> <li>Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> </ol> |  |  |
| Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure                                     | 2. 1-Octanol. Eastman organic                                                            |  |  |
| Bogan, and Wilhelm (3).<br>See neon + octane data sheet for                                                    | chemicals. Distilled.                                                                    |  |  |
| MOLE UELAILS.                                                                                                  |                                                                                          |  |  |
|                                                                                                                | ESTIMATED ERROR:                                                                         |  |  |
|                                                                                                                | $\delta T/K = 0.03$ $\delta P/mmHq = 0.5$                                                |  |  |
|                                                                                                                | $\delta X_{1}/X_{1} = 0.02$                                                              |  |  |
|                                                                                                                | REFERENCES:<br>1.Morrison, T.J.; Billett, F.                                             |  |  |
|                                                                                                                | J. Chem. Soc. 1948, 2033.<br>2.Battino,R.;Evans,F.D.;Danforth,W.F.                       |  |  |
|                                                                                                                | J.Am.Oil Chem. Soc. 1968, 45, 830.<br>3.Battino,R.;Banzhof,M.;Bogan,M.;<br>Wilhelm, E.   |  |  |
|                                                                                                                | <u>Anal. Chem. 1971, 43</u> , 806.                                                       |  |  |

| COMPONENTS:                                               | ORIGINAL MEASUREMENTS:                       |  |  |
|-----------------------------------------------------------|----------------------------------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                    | Wilcock, R.J.; Battino, R.;                  |  |  |
|                                                           | Danforth, W.F; Wilhelm, E.                   |  |  |
| 2. 1-Decanol; C <sub>10</sub> H <sub>22</sub> O; 112-30-1 |                                              |  |  |
|                                                           | <u>J.Cnem.Thermodyn</u> . 1978, 10, 817-822. |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
| VARIABLES:                                                | PREPARED BY:                                 |  |  |
| T/K: 298.09                                               | A.L. Cramer                                  |  |  |
| P/KPa: 101.325 (1 atm)                                    |                                              |  |  |
|                                                           |                                              |  |  |
| EXPERIMENTAL VALUES:                                      |                                              |  |  |
| T/K Mol Fraction                                          | Bunsen Ostwald                               |  |  |
| , c                                                       | Coefficient Coefficient                      |  |  |
| $X_1 \times 10^4$                                         | $\alpha \times 10^2$ L x $10^2$              |  |  |
|                                                           |                                              |  |  |
| 298.09 1.978                                              | 2.316 2.527                                  |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
| The solubility value was adjusted to a                    | partial pressure of neon of                  |  |  |
| 101.325 kPa by Henry's law.                               |                                              |  |  |
|                                                           |                                              |  |  |
| The Bunsen coefficients were calculate                    | d by the compiler.                           |  |  |
| A proliminary report of the work appea                    | red in Conf. Int. Thermodyn. Chim            |  |  |
| $\{C, R_{2}\}, 4$ th 1975, 6, 122 - 128; Chem.            | Abstr. 1977, 86, 22375d.                     |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
| AUXILIARY                                                 | INFORMATION                                  |  |  |
| METHOD/APPARATUS/PROCEDURE:                               | SOURCE AND PURITY OF MATERIALS:              |  |  |
| The apparently is based on the do-                        | 1 Noon Matheman Co. Ing                      |  |  |
| sign of Morrison and Billett (1), and                     | Purest commercially available                |  |  |
| the version used is described by                          | grade.                                       |  |  |
| Battino, Evans, and Danforth (2).                         | -                                            |  |  |
| The degassing apparatus and procedure                     | 2. 1-Decanol. Eastman Organic                |  |  |
| are described by Battino, Banzhof,                        | Chemicals. Distilled.                        |  |  |
| See neon $+$ octane data sheet for                        |                                              |  |  |
| more details.                                             |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           |                                              |  |  |
|                                                           | ESTIMATED ERROR:<br>$\delta T/K = 0.03$      |  |  |
|                                                           | $\delta P/mHg = 0.5$                         |  |  |
|                                                           | $\delta X_1 / X_1 = 0.02$                    |  |  |
|                                                           |                                              |  |  |
|                                                           | REFERENCES:                                  |  |  |
|                                                           | 1.Morrison, T.J.; Billett. F.                |  |  |
|                                                           | J. Chem. Soc. 1948, 2033.                    |  |  |
|                                                           | 2.Battino,R.;Evans,F.D.;Danforth,W.F.        |  |  |
|                                                           | J.Am.Oil Chem. Soc. 1968, 45, 830.           |  |  |
|                                                           | Wilhelm, E.                                  |  |  |
|                                                           | Anal. Chem. 1971, 43, 806.                   |  |  |
| 1                                                         |                                              |  |  |

x

| COMPONENTS :                     |                                               | ORIGINAL MEASUREMENTS:                                                                                                                    |  |  |  |  |  |  |  |
|----------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|
| 1. Neon; Ne; 7                   | 440-01-9                                      | Lannung, A.                                                                                                                               |  |  |  |  |  |  |  |
| 2. Cyclohexano                   | 1; C <sub>6</sub> H <sub>12</sub> O; 108-93-0 |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               | T                                                                                                                                         |  |  |  |  |  |  |  |
|                                  |                                               | <u>U. Am. Chem. 300</u> . 1930, <u>52</u> , 68-80.                                                                                        |  |  |  |  |  |  |  |
| VARIABLES:                       | 200 15 - 210 15                               | PREPARED BY:                                                                                                                              |  |  |  |  |  |  |  |
| T/K:                             | 298.15 = 310.15                               | P.L. Long                                                                                                                                 |  |  |  |  |  |  |  |
| Ne P/KPd:                        | 101.525 (I aum)                               |                                                                                                                                           |  |  |  |  |  |  |  |
| EXPERIMENTAL VALUES:             |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  | T/K Mol Fraction                              | Bunsen Ostwald                                                                                                                            |  |  |  |  |  |  |  |
|                                  | $x = 10^{4}$                                  | coefficient coefficient                                                                                                                   |  |  |  |  |  |  |  |
|                                  | <u> x 10</u>                                  |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  | 298.15     0.714       298.15     0.723       | 1.51 1.65                                                                                                                                 |  |  |  |  |  |  |  |
|                                  | 303.15 0.759                                  | 1.60 1.78                                                                                                                                 |  |  |  |  |  |  |  |
|                                  | 310.15 0.807                                  | 1.69 1.92                                                                                                                                 |  |  |  |  |  |  |  |
|                                  | 310.15 0.831                                  | 1.74 1.98                                                                                                                                 |  |  |  |  |  |  |  |
| Smoothed Data:                   | $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln$  | $X_1 = 8386.6 + 51.199 T$                                                                                                                 |  |  |  |  |  |  |  |
|                                  | Std. Dev. $\Delta G^{O} = 28.9$ ,             | Coef. Corr. = 0.9956                                                                                                                      |  |  |  |  |  |  |  |
|                                  | $\Delta H^{O}/J \text{ mol}^{-1} = 8386.6,$   | $\Delta S^{O}/J K^{-1} mol^{-1} = -51.199$                                                                                                |  |  |  |  |  |  |  |
|                                  | T/K Mol Fra                                   | ction $\Delta G^{O}/J \text{ mol}^{-1}$                                                                                                   |  |  |  |  |  |  |  |
|                                  | X <sub>1</sub> x                              | 10 <sup>4</sup>                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
| 303.15 0.760 23908               |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  | 02 24164                                      |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               | 45 24420                                                                                                                                  |  |  |  |  |  |  |  |
| The mole fractic                 | on solubility and the O                       | stwald coefficients were calculated                                                                                                       |  |  |  |  |  |  |  |
| by the comprise.                 | ,                                             |                                                                                                                                           |  |  |  |  |  |  |  |
| The solubility of                | of neon in cyclohexanol                       | reported by G. Cauquil J. Chim. Phys.                                                                                                     |  |  |  |  |  |  |  |
| 1927, <u>68</u> , 53 1S          | unsatisfactory and sho                        | uld not be used.                                                                                                                          |  |  |  |  |  |  |  |
|                                  | AUXILIARY                                     | INFORMATION                                                                                                                               |  |  |  |  |  |  |  |
| METHOD:                          |                                               | SOURCE AND PURITY OF MATERIALS:                                                                                                           |  |  |  |  |  |  |  |
| Gas absorptio                    | on. The gas is pre-                           | 1. Neon. Linde's Liquid Air                                                                                                               |  |  |  |  |  |  |  |
| volume absorbed                  | is the difference be-                         | <ol> <li>Cyclohexanol. "pur", Poulenc<br/>Freres, fractionated twice in<br/>vacuo; used portion with m.p. =<br/>23.6 - 23.9 0c</li> </ol> |  |  |  |  |  |  |  |
| tween initial an                 | d final gas volumes.                          |                                                                                                                                           |  |  |  |  |  |  |  |
| the weight of me                 | ercury displaced.                             |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  | 23.0 23.3 C.                                  |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
| × .                              |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
| APPARATUS / PROCEDUR             | E :                                           | ESTIMATED ERROR:                                                                                                                          |  |  |  |  |  |  |  |
| The apparatus                    | is a modification of                          |                                                                                                                                           |  |  |  |  |  |  |  |
| that of von Antr                 | opoff (1). A cali-                            | $\delta T/K = 0.03$                                                                                                                       |  |  |  |  |  |  |  |
| and bulb is encl                 | osed in an air thermo-                        | PEPERENCEC -                                                                                                                              |  |  |  |  |  |  |  |
| stat. Mercury i                  | s used as the cali-                           | 1. v. Antropoff. A.                                                                                                                       |  |  |  |  |  |  |  |
| solvent is decas                 | ssed in the apparatus.                        | Z. <u>Electrochem</u> . 1919, <u>25</u> , 269.                                                                                            |  |  |  |  |  |  |  |
| The solvent and                  | the gas are shaken                            |                                                                                                                                           |  |  |  |  |  |  |  |
| cogetner until e<br>established. | quilibrium is                                 |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               |                                                                                                                                           |  |  |  |  |  |  |  |
|                                  |                                               |                                                                                                                                           |  |  |  |  |  |  |  |

| COMPONENTS:                                                                                                                                                                                                                                                                    |                        |                       |                             | ORIGINAL MEASUREMENTS:                                                       |                    |                     |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|-----------------------------|------------------------------------------------------------------------------|--------------------|---------------------|--|--|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                         |                        |                       | Lannung, A.                 |                                                                              |                    |                     |  |  |
| 2. 2-Propanone (Acetone); C <sub>3</sub> H <sub>6</sub> O;<br>67-64-1                                                                                                                                                                                                          |                        |                       |                             |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             | <u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68-80.                           |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             |                                                                              |                    |                     |  |  |
| VARIABLES:<br>T/K: 288.15 - 298.15                                                                                                                                                                                                                                             |                        |                       | PREPARED BY:                |                                                                              |                    |                     |  |  |
| Ne P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                      |                        |                       | P.L. Long                   |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             |                                                                              |                    |                     |  |  |
| EXPERIMENTAL VALUES                                                                                                                                                                                                                                                            | •                      |                       |                             |                                                                              |                    | _                   |  |  |
|                                                                                                                                                                                                                                                                                | T/K M                  | ol Fraction           | Bun<br>Cooff                | sen<br>icient Co                                                             | Ostwald            |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        | $x_{1} \times 10^{4}$ | αχ                          | 10 <sup>2</sup>                                                              | $L \times 10^2$    |                     |  |  |
|                                                                                                                                                                                                                                                                                | 288 15                 | 1,39                  | 4                           | 28                                                                           | 4.52               |                     |  |  |
|                                                                                                                                                                                                                                                                                | 288.15                 | 1.33                  | 4.                          | 10                                                                           | 4.33               |                     |  |  |
|                                                                                                                                                                                                                                                                                | 293.15                 | 1.49                  | 4.                          | 56                                                                           | 4.89               |                     |  |  |
|                                                                                                                                                                                                                                                                                | 293.15                 | 1.54                  | 4.                          | 70                                                                           | 5.04               |                     |  |  |
|                                                                                                                                                                                                                                                                                | 293.15                 | 1.41<br>1.59          | 4.                          | 30<br>82                                                                     | 4.01<br>5.26       |                     |  |  |
|                                                                                                                                                                                                                                                                                | 298.15                 | 1.64                  | 4                           | 98                                                                           | 5.44               |                     |  |  |
|                                                                                                                                                                                                                                                                                | 298.15                 | 1.48                  | 4.                          | 50                                                                           | 4.91               |                     |  |  |
| Smoothed Data:                                                                                                                                                                                                                                                                 | ∆G <sup>O</sup> /J mol | $-1 = - RT \ln 2$     | x, =                        | 10072 + 3                                                                    | 39.025 T           |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        | 0                     | T                           |                                                                              |                    |                     |  |  |
| Std. Dev. $\Delta G^{\circ} = 96.1$ , Coef. Corr. = 0.8611                                                                                                                                                                                                                     |                        |                       |                             |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        | = 10072, Δ            | 5 / 0                       |                                                                              | = -39.025          |                     |  |  |
| T/K Mol Fraction $\Delta G^{\circ}/J \text{ mol}^{-1}$                                                                                                                                                                                                                         |                        |                       |                             |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        | X_1 × 1               | 10 -                        |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                | 17                     |                       |                             |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                | 3.15 1.4<br>B.15 1.5   | 7<br>7                | 2151                        | 12<br>)7                                                                     |                    |                     |  |  |
| The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.                                                                                                                                                                                     |                        |                       |                             |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        | AUXILIARY             | INFORM                      | IATION                                                                       |                    |                     |  |  |
| METHOD:                                                                                                                                                                                                                                                                        |                        |                       | SOURC                       | E AND PURI                                                                   | TY OF MATERIA      | ALS:                |  |  |
| Gas absorption                                                                                                                                                                                                                                                                 | as is pre-             | 1.                    | 1. Neon. Linde's Liquid Air |                                                                              |                    |                     |  |  |
| saturated with solvent vapor. The gas<br>volume absorbed is the difference be-                                                                                                                                                                                                 |                        |                       |                             | Factory. Contained 1 per cent<br>by volume of helium.                        |                    |                     |  |  |
| The amount of solvent is determined by                                                                                                                                                                                                                                         |                        |                       |                             | 2. Acetone. Kahlbaum's "Zur                                                  |                    |                     |  |  |
| the weight of mercury displaced.                                                                                                                                                                                                                                               |                        |                       |                             | Analyse." Used after tests<br>showed absence of water, acid<br>and aldehyde. |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       | ļ                           |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             |                                                                              |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             | ESTIMATED ERROR:                                                             |                    |                     |  |  |
| APPARATUS/PROCEDURE:                                                                                                                                                                                                                                                           |                        |                       |                             |                                                                              | ለጥ/к = 0 0         | 3                   |  |  |
| The apparatus is a modification of<br>that of von Antropoff (1). A cali-<br>brated, combined all glass manometer<br>and bulb is enclosed in an air thermo-<br>stat. Mercury is used as the cali-<br>bration and confining liquid. The<br>solvent is degassed in the apparatus. |                        |                       |                             |                                                                              | 51/M - 0.0         | -                   |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             | TNOT                                                                         |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             | ENCES:                                                                       |                    |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             | v. Antrop                                                                    | off, A.            |                     |  |  |
|                                                                                                                                                                                                                                                                                |                        |                       |                             | Z. Electr                                                                    | <u>ochem</u> . 191 | 9, <u>25</u> , 269. |  |  |
| The solvent and                                                                                                                                                                                                                                                                | the gas an             | re shaken             |                             |                                                                              | _                  |                     |  |  |
| togetner until ed                                                                                                                                                                                                                                                              | n 15                   |                       |                             |                                                                              |                    |                     |  |  |
| cocapitonea.                                                                                                                                                                                                                                                                   |                        |                       |                             |                                                                              |                    |                     |  |  |
| COMPONENTS:                                             | ORIGINAL MEASUREMENTS:                                   |
|---------------------------------------------------------|----------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                  | Clever, H.L.; Saylor, J.H.;                              |
| 2. Undecafluoro(trifluoromethyl) -                      | GIOSS, P.M.                                              |
| cyclohexane (Perfluoromethyl-                           |                                                          |
| cyclohexane); C <sub>7</sub> F <sub>14</sub> ; 355-02-2 |                                                          |
| / 14                                                    | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 89-91.  |
|                                                         |                                                          |
| VARIABLES:                                              | PREPARED BY:                                             |
| T/K: 289.15 - 316.25                                    |                                                          |
| P/KPa: 101.325 (1 atm)                                  | P.L. Long                                                |
|                                                         |                                                          |
| EXPERIMENTAL VALUES:                                    |                                                          |
| T/K Mol Fraction                                        | Bunsen Ostwald                                           |
|                                                         | Coefficient Coefficient                                  |
| $X_1 \times 10^4$                                       | $\alpha \times 10^2$ L $\times 10^2$                     |
|                                                         |                                                          |
|                                                         | 13.2 $14.6$                                              |
| 316.25 12.2                                             | 13.6 15.7                                                |
| <u> </u>                                                |                                                          |
| Smoothed Data: $\Delta G^{-}/J \mod {-} = - RT \ln$     | $x_1 = 3420.2 + 44.973 \text{ T}$                        |
| Std. Dev. $\Delta G^{\circ} = 4.2$ , C                  | oef. Corr. = 0.9999                                      |
| $A_{\mu}^{0}$ (T mol <sup>-1</sup> - 3420.2             | $AS^{0}/T r^{-1} mol^{-1}44.973$                         |
|                                                         |                                                          |
| T/K Mol Fra                                             | ction $\Delta G^{O}/J \text{ mol}^{-1}$                  |
| X, X                                                    | 10 <sup>4</sup>                                          |
|                                                         |                                                          |
|                                                         | / 16379<br>0 16604                                       |
| 298.15 11.                                              | 3 16829                                                  |
| 303.15 11.                                              | 5 17054                                                  |
| 308.15 11.                                              | 8 17279                                                  |
| 313.15 12.                                              | 3 17728                                                  |
|                                                         |                                                          |
| The solubility values were adjusted to                  | a partial pressure of neon of                            |
| 101.325 KPa (1 atm) by Henry's law.                     |                                                          |
| The Bunsen coefficients were calculate                  | d by the compiler.                                       |
|                                                         |                                                          |
| AUXILIARY                                               | INFORMATION                                              |
| METHOD:                                                 | SOURCE AND PURITY OF MATERIALS:                          |
| Volumetric. The apparatus (1) is a                      | 1. Neon. Matheson Co., Inc. Both                         |
| modification of that used by Morrison                   | standard and research grades                             |
| and Billett (2). Modifications in-                      | were used.                                               |
| storage tubing, a manometer for con-                    | 2. Perfluoromethylcyclohexane.                           |
| stant reference pressure, and an extra                  | du Pont FCS-326, shaken with con-                        |
| gas buret for highly soluble gases.                     | centrated H <sub>2</sub> SO <sub>4</sub> , washed, dried |
|                                                         | over Drierite and distilled.                             |
|                                                         | b.p. 75.95 to 76.05° at 753 mm.,                         |
|                                                         | 111. D.P. /0.14 at /60 mm.                               |
|                                                         |                                                          |
| APPARATUS / PROCEDURE :                                 | ESTIMATED ERROR:                                         |
| (a) Degassing, 700 ml of solvent                        | $\delta P/mmH\alpha = 3$                                 |
| is shaken and evacuated while attached                  | $\delta x_1 / x_1 = 0.03$                                |
| to a cold trap, until no bubbles are                    |                                                          |
| seen; solvent is then transferred                       | REFERENCES:                                              |
| leased as a fine mist into a continu-                   | 1. Clever, H.L.; Battino. R.;                            |
| ously evacuated flask. (b) Solvent is                   | Saylor, J.H.; Gross, P.M.                                |
| saturated with gas as it flows through                  | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078.           |
| gas buret. Pressure is maintained at                    | 2. Morrison, T.J.: Billett, F.                           |
| 1 atm as the gas is absorbed.                           | J. Chem. Soc. 1948, 2033;                                |
| _                                                       | <u>ibid. 1952, 3819.</u>                                 |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 Evans, F.D.; Battino, R. 1. 2. Hexafluorobenzene; C<sub>6</sub>F<sub>6</sub>; 392-56-3 J. Chem. Thermodyn. 1971, 3, 753-760. VARIABLES: PREPARED BY: T/K: 282.91 - 298.14 P/kPa: 101.325 (1 atm) H.L. Clever **EXPERIMENTAL VALUES:** Bunsen T/K Mol Fraction Ostwald Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 282.91 2.66 5.25 5.44 5.55 283.35 2.71 5.35 3.43 7.24 297.83 6.64 298.14 3.47 6.71 7.32 Smoothed Data:  $\overline{\Delta G^{O}/J \text{ mol}^{-1}} = -RT \ln X_{1} = 11850 + 26.514 T$ Std. Dev.  $\Delta G^{O} = 12.4$ , Coef. Corr. = 0.9987  $\Delta H^{O}/J \text{ mol}^{-1} = 11850, \Delta S^{O}/J \text{ K}^{-1} \text{ mol}^{-1} = 26.514$ Mol Fraction  $\Delta G^{O}/J \text{ mol}^{-1}$ т/к  $x_{1} \times 10^{4}$ 278.15 2.45 19225 283.15 2.69 19357 288.15 2.93 19490 293.15 3.19 19622 298.15 19755 3.46 The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus is based on the de-Neon. Either Air Products & 1. sign by Morrison and Billett (1) and Chemicals, Inc., or Matheson Co., the version used is described by Inc. Better than 99 mol % (usually 99.9+). Battino, Evans, and Danforth (2). 2. Hexafluorobenzene. Imperial Smelting Co., Avonmouth, U.K. GC purity 99.7%, density at 25°C APPARATUS/PROCEDURE: Degassing. Up to 500 cm<sup>3</sup> of sol-1.60596 g cm<sup>-3</sup>. Purified by vent is placed in a flask of such size that the liquid is about 4 cm see: Anal. Chem. 1968, 40, 224. deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N<sub>2</sub> trap until the permanent gas residual pressure drops ESTIMATED ERROR: δΤ/Κ = 0.03 to 5 microns.  $\delta P/mmHg = 0.5$ Solubility Determination. The degassed solvent passes in a thin film  $\delta X_1 / X_1$ = 0.015 down a glass spiral tube containing the solute gas plus the solvent vapor **REFERENCES**: at a total pressure of one atm. The volume of gas absorbed is found by 1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033. difference between the initial and final gas volume in the buret system. 2. Battino, R.; Evans, F.D.; The solvent is collected in a tared Danforth, W.F. J. <u>Am. Oil Chem. Soc</u>. 1968, <u>45</u>, flask and weighed. 830.

| COMPONENTS :                                                                                                                                                                                                                                                                 |                          |                                                       | ORIGINAL MEASUREMENTS:                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                       |                          |                                                       | Saylor, J. H.; Battino, R.                                                                  |
| 2 Elucrohongonos C H Es 462-06-6                                                                                                                                                                                                                                             |                          | 462-06-6                                              |                                                                                             |
| z. ridorobenze.                                                                                                                                                                                                                                                              | , °6"5",                 | 402-00-0                                              | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334-1337.                                 |
| VARIABLES:                                                                                                                                                                                                                                                                   |                          |                                                       | PREPARED BY:                                                                                |
| T/K: 2<br>P/kPa: 1                                                                                                                                                                                                                                                           | 88.15 - 32<br>01.325 (1  | 8.15<br>atm)                                          | H.L. Clever                                                                                 |
| EXPERIMENTAL VALUE                                                                                                                                                                                                                                                           | S:                       |                                                       |                                                                                             |
|                                                                                                                                                                                                                                                                              | т7к м                    | ol Fraction<br>X, x 10 <sup>4</sup>                   | Bunsen Ostwald<br>Coefficient Coefficient<br>a x 10 <sup>2</sup> L x 10 <sup>2</sup>        |
|                                                                                                                                                                                                                                                                              |                          |                                                       | 2.50 2.60                                                                                   |
|                                                                                                                                                                                                                                                                              | 298.15                   | 1.52                                                  | 3.62 3.95                                                                                   |
|                                                                                                                                                                                                                                                                              | 313.15                   | 1.84                                                  | 4.28 4.91<br>4.72 5.67                                                                      |
|                                                                                                                                                                                                                                                                              | <u>0</u>                 | -1 -1                                                 |                                                                                             |
| Smoothed Data:                                                                                                                                                                                                                                                               | ∆G˘/J mol                | = - RT ln                                             | $X_1 = 7313.1 + 48.254 T$                                                                   |
|                                                                                                                                                                                                                                                                              | Std. Dev.                | $\Delta G^{O} = 66.2,$                                | Coef. Corr. = 0.9969                                                                        |
|                                                                                                                                                                                                                                                                              | ∆H <sup>O</sup> /J mol   | -1 = 7313.1,                                          | $\Delta S^{O}/J K^{-1} mol^{-1} = -48.254$                                                  |
|                                                                                                                                                                                                                                                                              |                          | T/K Mol Fra                                           | ction $\Delta G^{O}/J \text{ mol}^{-1}$                                                     |
|                                                                                                                                                                                                                                                                              |                          | X <sub>1</sub> x                                      | 10 <sup>4</sup>                                                                             |
|                                                                                                                                                                                                                                                                              | 28                       | 8.15 1.4                                              | 2 21218                                                                                     |
|                                                                                                                                                                                                                                                                              | 29                       | 3.15 1.5                                              | 0 21459                                                                                     |
|                                                                                                                                                                                                                                                                              | 29<br>30                 | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | 8 21700<br>6 21941                                                                          |
|                                                                                                                                                                                                                                                                              | 30                       | 8.15 1.7                                              | 4 22183                                                                                     |
|                                                                                                                                                                                                                                                                              | 31<br>31                 | 3.15 1.8<br>8.15 1.9                                  | 2 22424<br>0 22665                                                                          |
|                                                                                                                                                                                                                                                                              | 32                       | 3.15 1.9                                              | 8 22906                                                                                     |
|                                                                                                                                                                                                                                                                              | 32                       | 8.15 2.0                                              | 7 23148                                                                                     |
|                                                                                                                                                                                                                                                                              |                          |                                                       |                                                                                             |
| AUXILIARY I                                                                                                                                                                                                                                                                  |                          |                                                       | INFORMATION                                                                                 |
| METHOD:<br>The apparatus<br>sign by Morrison                                                                                                                                                                                                                                 | s is based<br>h and Bill | on the de-<br>ett (1) and                             | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Research<br>grade.                |
| Clever, Battino                                                                                                                                                                                                                                                              | , Saylor,                | and Gross (2).                                        | 2. Fluorobenzene. Eastman White<br>label. Dried over P.O., dis-                             |
| The solubility                                                                                                                                                                                                                                                               | values wer               | e adjusted to<br>n of                                 | 4 10 <sup>7</sup><br>tilled, b.p. 84.28-84.68 <sup>o</sup> C.                               |
| 101.325 kPa (1 atm) by Henry's law.                                                                                                                                                                                                                                          |                          | nry's law.                                            |                                                                                             |
| The Bunsen coef:<br>lated by the cor                                                                                                                                                                                                                                         | ficients w<br>mpiler.    | ere calcu-                                            |                                                                                             |
| APPARATUS / PROCEDURE :                                                                                                                                                                                                                                                      |                          |                                                       | ESTIMATED ERROR:                                                                            |
| The degassed solvent is passed<br>through a glass spiral tube containing<br>the gas. The gas dissolves rapidly<br>and the saturated liquid flows into a<br>buret system. The volume of gas dis-<br>solved is determined by the increase<br>in the solution level at constant |                          | s passed<br>be containing<br>es rapidly               | $\delta T/K = 0.03$<br>$\delta P/mmHg = 1$<br>$\delta X_1/X_1 = 0.04$                       |
|                                                                                                                                                                                                                                                                              |                          | flows into a                                          | REFERENCES                                                                                  |
|                                                                                                                                                                                                                                                                              |                          | or gas dis-<br>he increase<br>constant                | <ol> <li>Morrison, T.J.; Billett, F.<br/><u>J. Chem</u>. <u>Soc</u>. 1948, 2033.</li> </ol> |
| determined in the solubilities ext                                                                                                                                                                                                                                           | ne burets.<br>ra solven  | For low<br>t is run                                   | <ol> <li>Clever, H.L.: Battino, R.;<br/>Saylor, J.H.; Gross, P.M.</li> </ol>                |
| through the bure                                                                                                                                                                                                                                                             | et system a              | and weighed.                                          | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078.                                              |

I.

| CONDONENTE                           |              |                                                 |                         |                                       |
|--------------------------------------|--------------|-------------------------------------------------|-------------------------|---------------------------------------|
|                                      |              | ORIGINAL MEASUR                                 | EMENTS:                 |                                       |
| 1. Neon; Ne; 7440-01-9               |              | Linford, R.G                                    | .; HILGEDRANG, J.H.     |                                       |
| 2. 1,1,2-Trichl                      | .oro-1,2,2   | -trifluoro-                                     |                         |                                       |
| ethane (Fre                          | eon 113);    | C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub> ; | Trans Farad             | av Soc 1970 66 577-581                |
|                                      |              |                                                 | <u></u>                 |                                       |
|                                      |              |                                                 |                         |                                       |
| VARIABLES:                           |              |                                                 | PREPARED BY:            |                                       |
| T/K: 2                               | 279.25 - 2   | 98.15                                           |                         | P I Iong                              |
| Ne r/kra: 1                          | .01.325 (    |                                                 | ļ ·                     | F. D. Dong                            |
| EXPERIMENTAL VALUES                  | 3:           |                                                 |                         |                                       |
|                                      | ጥ / የ        | Mol Fraction                                    | Bunson                  | Ostwald                               |
|                                      | 1/1          | MOI TIUCLION                                    | Coefficient             | Coefficient                           |
|                                      |              | $X_{1} \times 10^{4}$                           | α x 10 <sup>2</sup>     | $L \times 10^2$                       |
|                                      | 279.25       | 4.22                                            | 8.11                    | 8.29                                  |
|                                      | 283.81       | 4.37                                            | 8.34                    | 8.67                                  |
|                                      | 287.05       | 4.46                                            | 8.48                    | 8.91<br>9 18                          |
|                                      | 292.37       | 4.65                                            | 8.76                    | 9.38                                  |
|                                      | 294.55       | 4.73                                            | 8.89                    | 9.59                                  |
|                                      | 298.15       | 4.86                                            | 9.09                    | 9.92                                  |
| Smoothed Data:                       | ∆G°/J mol    | $L^{-1} = - RT ln$                              | $x_1 = 5160.2 +$        | 46.145 T                              |
|                                      | Std. Dev.    | ΔG° = 5.5,                                      | Coef. Corr.             | = 0.9998                              |
|                                      | AHO/T mol    | -1 = 5160.2                                     |                         | $101^{-1} = -46.145$                  |
|                                      | 811 /0 11101 | J100 <b>.2</b> /                                |                         |                                       |
|                                      |              | /v Mol Erac                                     | tion AC <sup>o</sup> /T | mol-1                                 |
|                                      | 17           | $X_1 \times 1$                                  | 04                      | mot                                   |
|                                      | 278          | 15 4.17                                         | 17,9                    | 95                                    |
|                                      | 283.         | 15 4.34                                         | 18,2                    | 26                                    |
|                                      | 288.         | 15 4.51                                         | 18,4                    | 57                                    |
|                                      | 293.         | 15 4.68                                         | 18,6<br>18,9            | 88                                    |
|                                      |              |                                                 |                         |                                       |
| The Bunsen an                        | d Ostwald    | coefficients                                    | were calculat           | ted by the compiler.                  |
|                                      |              |                                                 |                         |                                       |
|                                      |              | AUXILIARY                                       | INFORMATION             |                                       |
| METHOD:                              |              |                                                 | SOURCE AND PURI         | TTY OF MATERIALS:                     |
| Saturation of 2                      | liquid wit   | ch gas at a                                     | 1. Neon. S              | ource not given. Purest               |
| partial pressur                      | re of gas    | equal to                                        | commerci                | ally obtainable, dried                |
| l atm.                               |              |                                                 | before u                | lse.                                  |
|                                      |              |                                                 | 2. 1,1,2-Tr             | ichloro-1,2,2-trifluoro-              |
|                                      |              |                                                 | ethane.                 | Matheson, Coleman and                 |
|                                      |              |                                                 | Bell. S                 | pectroquality.                        |
|                                      |              |                                                 |                         |                                       |
|                                      |              |                                                 |                         |                                       |
|                                      |              |                                                 |                         |                                       |
|                                      |              |                                                 |                         |                                       |
| APPARATUS / PROCEDUR                 |              | <u></u>                                         | ESTIMATED ERROR         | R:                                    |
|                                      |              |                                                 | 1                       | $f_{\rm X} = 0.01$                    |
| Dymond-Hildebra                      | and appara   | atus (1) which                                  |                         | $(\text{Evaluator})^{1/1}$            |
| spray slugs of                       | degassed     | solvent into                                    |                         | · · · · · · · · · · · · · · · · · · · |
| the gas. The amount of gas dissolved |              | REFERENCES :                                    |                         |                                       |
| is calculated i                      | from init:   | al and final                                    | 1 Dumond                | J H . Hildebrand J U                  |
| pressures.                           |              |                                                 | Ind. End                | . Chem. Fundam. 1967. 6.              |
|                                      |              |                                                 | 130.                    |                                       |
|                                      |              |                                                 |                         |                                       |
|                                      |              |                                                 |                         |                                       |
|                                      |              |                                                 | 1                       |                                       |

| COMPONENTS :                                                                                             | ORIGINAL MEASUREMENTS:                                                                                       |  |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--|
| 1. Neon; Ne; 7440-01-9                                                                                   | de Wet, W.J.                                                                                                 |  |
| 2. 1,1,2,2-Tetrachloroethane;                                                                            |                                                                                                              |  |
| $C_2H_2Cl_4; 79-34-5$                                                                                    |                                                                                                              |  |
|                                                                                                          | T S Afr Chom Inst 1964 17 9-13                                                                               |  |
|                                                                                                          | <u><u><u></u></u>. <u><u></u>. <u><u></u>. <u></u>. <u></u>. <u></u>. <u></u>. <u></u>. <u></u>.</u></u></u> |  |
| VARIABLES:                                                                                               | PREPARED BY:                                                                                                 |  |
| T/K: 291.45 - 304.95                                                                                     |                                                                                                              |  |
| P/kPa: 101.325 (1 atm)                                                                                   | P.L. Long                                                                                                    |  |
|                                                                                                          |                                                                                                              |  |
| EVDEDIMENTAL VALUES.                                                                                     |                                                                                                              |  |
| EXTERITE VALUES:                                                                                         | Pungon Ogtupld                                                                                               |  |
|                                                                                                          | Coefficient Coefficient                                                                                      |  |
|                                                                                                          |                                                                                                              |  |
| $X_1 \times 10^{-1}$                                                                                     | $\alpha \times 10^{-1}$ L x $10^{-1}$                                                                        |  |
| 201 45 1 30                                                                                              | 2 96 3 16                                                                                                    |  |
| 298.85 1.50                                                                                              | 3,17 3,47                                                                                                    |  |
| 304.95 1.61                                                                                              | 3.40 3.80                                                                                                    |  |
|                                                                                                          |                                                                                                              |  |
| Smoothed Data: $\Delta G^{O}/J \mod^{-1} = -RT \ln$                                                      | $x_1 = 8026.4 + 46.315 \text{ T}$                                                                            |  |
| Std. Dev. $\Delta G^{O} = 8.6$ , C                                                                       | Coef. Corr. = 0.9996                                                                                         |  |
| $\Lambda H^{O}/T$ mol <sup>-1</sup> = 2026 4                                                             | $AS (I K^{-1} mo)^{-1}46 215$                                                                                |  |
|                                                                                                          |                                                                                                              |  |
| T/K Mol Fra                                                                                              | action $\Delta G^{O}/J \text{ mol}^{-1}$                                                                     |  |
| -,                                                                                                       | 104                                                                                                          |  |
| <u> </u>                                                                                                 |                                                                                                              |  |
| 288.15 1.3                                                                                               | 21372                                                                                                        |  |
| 293.15 1.4                                                                                               | 1 21604                                                                                                      |  |
| 298.15 1.4                                                                                               | 9 21835                                                                                                      |  |
| 303.15 1.5                                                                                               | 8 22067                                                                                                      |  |
| 308.15 1.6                                                                                               | 6 22299                                                                                                      |  |
|                                                                                                          |                                                                                                              |  |
| The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. |                                                                                                              |  |
|                                                                                                          |                                                                                                              |  |
| The mole fraction solubility and Ostwa                                                                   | ald coefficients were calculated                                                                             |  |
| by the compiler.                                                                                         |                                                                                                              |  |
|                                                                                                          | ······································                                                                       |  |
| AUXILIARY                                                                                                | INFORMATION                                                                                                  |  |
| METHOD: Volumetric.                                                                                      | SOURCE AND PURITY OF MATERIALS:                                                                              |  |
| To degas, the solvent is placed in a                                                                     | 1. Neon. No source given. The gas                                                                            |  |
| large continuously evacuated bulb                                                                        | purified over activated charcoal                                                                             |  |
| until the solvent boils freely with-                                                                     | at liquid air temperature.                                                                                   |  |
| out further release of dissolved                                                                         | Impurities estimated to be less                                                                              |  |
| gases.                                                                                                   | than 0.3 percent.                                                                                            |  |
| To saturate, the solvent flows in                                                                        |                                                                                                              |  |
| a thin film through a glass spiral                                                                       | 2. 1,1,2,2,-Tetrachloroethane. No                                                                            |  |
| containing the gas. The volume of                                                                        | source given. 1,1,2,2,-Tetra-                                                                                |  |
| gas absorbed is measured on an                                                                           | diately before use                                                                                           |  |
| attached buret system.                                                                                   | diacely before use.                                                                                          |  |
|                                                                                                          |                                                                                                              |  |
|                                                                                                          | FSTIMATED EDDOD.                                                                                             |  |
| APPARATUS/PROCEDURE:                                                                                     | LOIMATED ERROR.                                                                                              |  |
| The apparatus is a modification of                                                                       | $\delta T/K = 0.05$                                                                                          |  |
| that used by Morrison and Billett (1)                                                                    |                                                                                                              |  |
| and others (2). The degassed solvent                                                                     |                                                                                                              |  |
| is saturated with gas as it flows                                                                        | REFERENCES                                                                                                   |  |
| through a glass spiral containing the                                                                    | I Morrison T. Dillett D                                                                                      |  |
| gas. The amount of solvent passing                                                                       | I. MOTTISON, T.J.; BILLETT, F.<br>J. Chom. Soc. 1049 2022.                                                   |  |
| through the spiral is such that 10-                                                                      | ibid. 1952. 3819                                                                                             |  |
| 25 ml of gas was absorbed.                                                                               | <u></u> ,,,,                                                                                                 |  |
|                                                                                                          | 2. Clever, H.L.; Battino, R.;                                                                                |  |
|                                                                                                          | Saylor, J.H.; Gross, P.M.                                                                                    |  |
|                                                                                                          | J. Phys. Chem. 1957, <u>61</u> , 1078.                                                                       |  |
|                                                                                                          |                                                                                                              |  |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Saylor, J.H.; Battino, R. 2. Chlorobenzene; C<sub>6</sub>H<sub>5</sub>Cl; 108-90-7 J. Phys. Chem. 1958, 62, 1334-1337. VARIABLES: PREPARED BY: т/к: 288.15 - 328.15 H.L. Clever P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES: T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $x_{1} \times 10^{4}$ α x 10<sup>2</sup> L x 10<sup>2</sup> 288.15 1.89 0.853 1.99 298.15 0.986 2.16 2.36 1.17 2.90 313.15 2.53 328.15 1.40 2.97 3.57  $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln x_{1} = 9630.0 + 44.457 T$ Smoothed Data: Std. Dev.  $\Delta G^{O} = 16.6$ , Coef. Corr. = 0.9998  $\Delta H^{O}/J \text{ mol}^{-1} = 9630.0, \Delta S^{O}/J \text{ K}^{-1} \text{ mol}^{-1} = -44.457$ Mol Fraction  $\Delta G^{O}/J \text{ mol}^{-1}$ T/K  $x_1 \times 10^4$ 0.86 288.15 22440 293.15 0.92 22663 0.98 298.15 22885 303.15 1.04 23107 1.11 308.15 23329 23552 313.15 1.18 318.15 23774 1.25 323.15 1.32 23996 328.15 1.40 24219 AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus is based on the de-1. Neon. Matheson Co., Research sign by Morrison and Billett(1) and grade. the version used is described by Clever, Battino, Saylor, and Gross (2). 2. Chlorobenzene, Eastman white label. Dried over P<sub>4</sub>O<sub>10</sub>, distilled, b.p. 131.67 - 131.71 °C. The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. ESTIMATED ERROR: **APPARATUS / PROCEDURE :** δТ/К = 0.03 The degassed solvent is passed δP/mmHg = 1 through a glass spiral tube containing = 0.04  $\delta X_1 / X_1$ the gas. The gas dissolves rapidly and the saturated liquid flows into a **REFERENCES:** buret system. The volume of gas dissolved is determined by the increase 1. Morrison, T.J.; Billett, F. in the solution level at constant J. Chem. Soc. 1948, 2033. pressure. The volume of liquid is determined in the burets. For low 2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. J. <u>Phys</u>. <u>Chem</u>. 1957, <u>61</u>, 1078. solubilities extra solvent is run through the buret system and weighed.

| COMPONENTS :                         |                                                           | ORIGINAL MEASUREMENTS:                                     |
|--------------------------------------|-----------------------------------------------------------|------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9               |                                                           | Saylor, J.H.; Battino, R.                                  |
|                                      |                                                           |                                                            |
| 2. Bromobenzen                       | e, c <sub>6</sub> <sup>n</sup> 5 <sup>b1</sup> , 108-80-1 |                                                            |
|                                      |                                                           | <u>J. Phys. Chem.</u> 1958, <u>62</u> , 1334-1337.         |
|                                      |                                                           |                                                            |
| VARIABLES:                           |                                                           | PREPARED BY:                                               |
| Т/К:                                 | 288.15 - 328.15                                           | H L Clever                                                 |
| P/kPa:                               | 101.325 (1 atm)                                           | n.h. Clevel                                                |
| EXPERIMENTAL VALUES                  | S:                                                        |                                                            |
|                                      | T/K Mol Fraction                                          | Bunsen Ostwald                                             |
|                                      | $x_1 \times 10^4$                                         | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$ |
|                                      | 288.15 0.706                                              | 1.52 1.60                                                  |
|                                      | 298.15 0.771                                              | 1.64 1.79                                                  |
|                                      | 328.15 0.932<br>328.15 1.07                               | 2.21 2.66                                                  |
| Smoothed Data:                       | $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln$              | $X_1 = 8405.2 + 50.394 T$                                  |
|                                      | Std. Dev. $\Delta G^{O} = 33.3$ ,                         | Coef. Corr. = 0.9993                                       |
|                                      | $\Delta H^{O}/J \text{ mol}^{-1} = 8405.2,$               | $\Delta S^{O}/J \ K^{-1} \ mol^{-1} = -50.394$             |
|                                      | T/K Mol Fr                                                | action $\Delta G^{O}/J \text{ mol}^{-1}$                   |
|                                      | ,<br>X, X                                                 | 104                                                        |
|                                      |                                                           | <u> </u>                                                   |
|                                      | 293.15 0.1                                                | 741 23178                                                  |
|                                      | 293.15 0.<br>303.15 0                                     | 786 23430<br>831 23682                                     |
|                                      | 308.15 0.                                                 | 877 23934                                                  |
|                                      | 313.15 0.1<br>318.15 0                                    | 924 24186<br>972 24438                                     |
|                                      | 323.15 1.                                                 | 02 24690                                                   |
|                                      | 328.15 1.                                                 | 07 24942                                                   |
|                                      |                                                           |                                                            |
|                                      | AUXILIARY                                                 | INFORMATION                                                |
| METHOD:                              | s is based on the de-                                     | SOURCE AND PURITY OF MATERIALS:                            |
| sign by Morrison                     | n and Billett(1) and                                      | grade.                                                     |
| the version used                     | d is described by<br>Savlor and Gross (2)                 | 2 Bromobenzene Fastman white                               |
| ciever, battino                      | , baylor, and cross (2)                                   | label. Dried over P <sub>4</sub> O <sub>10</sub> , dis-    |
| The solubility v                     | values were adjusted to                                   | tilled, b.p. 155.86 - 155.90 °C.                           |
| 101.325 kPa (1 a                     | atm) by Henry's law.                                      |                                                            |
| The Bunsen coeff<br>lated by the cor | ticients were calcu-<br>mpiler.                           |                                                            |
|                                      |                                                           | ESTIMATED ERROR:                                           |
| The degassed                         | solvent is passed                                         | $\delta T/K = 0.03$                                        |
| through a glass                      | spiral tube containing                                    | $\delta X_1 / X_1 = 0.04$                                  |
| and the saturate                     | ed liquid flows into a                                    |                                                            |
| buret system.                        | The volume of gas dis-                                    | REFERENCES:                                                |
| in the solution                      | level at constant                                         | J. Chem. Soc. 1948, 2033.                                  |
| pressure. The t                      | volume of liquid is                                       | 2 Clever H L Batting P .                                   |
| solubilities ext                     | tra solvent is run                                        | Saylor, J.H.; Gross, P.M.                                  |
| through the bure                     | et system and weighed.                                    | <u>J. Phys. Chem. 1957, 61, 1078.</u>                      |
|                                      |                                                           |                                                            |

| COMPONENTS:                                                                                                                                            |                                                   | ORIGINAL MEASUREMENTS:                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------|
| 1. Neon; Ne; 74                                                                                                                                        | 440-01-9                                          | Saylor, J.H.; Battino, R.                                   |
| 2. Iodobenzene; $C_{c}H_{c}I; 591-50-4$                                                                                                                |                                                   |                                                             |
|                                                                                                                                                        |                                                   | J. Phys. Chem. 1958, 62, 1334-1337.                         |
|                                                                                                                                                        |                                                   |                                                             |
|                                                                                                                                                        |                                                   |                                                             |
| VARIABLES:                                                                                                                                             | 288.15 - 328.15                                   | PREPARED BY:                                                |
|                                                                                                                                                        |                                                   | H.L. Clever                                                 |
| P/kPa: 1                                                                                                                                               | 101.325 (1 atm)                                   |                                                             |
| EXPERIMENTAL VALUES                                                                                                                                    | 3:                                                |                                                             |
|                                                                                                                                                        | T7K Mol Fraction                                  | Bunsen Ostwald                                              |
|                                                                                                                                                        | $x_1 \times 10^4$                                 | $\alpha \times 10^2$ L $\times 10^2$                        |
|                                                                                                                                                        | <u> </u>                                          |                                                             |
|                                                                                                                                                        | 298.15 0.539                                      | 1.08 1.18                                                   |
|                                                                                                                                                        | 313.15 0.621<br>328.15 0.787                      | 1.23 1.41                                                   |
|                                                                                                                                                        |                                                   |                                                             |
| Smoothed Data:                                                                                                                                         | $\Delta G'/J \mod = - RT \ln$                     | $x_1 = 10497 + 46.715 T$                                    |
|                                                                                                                                                        | Std. Dev. $\Delta G^{\circ} = 70.3$ ,             | Coef. Corr. = 0.9963                                        |
|                                                                                                                                                        | $\Delta H^{O}/J \text{ mol}^{-1} = 10497, \Delta$ | $S^{O}/J K^{-1} mol^{-1} = -46.715$                         |
|                                                                                                                                                        | T/K Mol Fra                                       | ction $\Delta G^{O}/J$ mol <sup>-1</sup>                    |
|                                                                                                                                                        | X <sub>1</sub> x                                  | 10 <sup>4</sup>                                             |
|                                                                                                                                                        | 288.15 0.4                                        | 54 23958                                                    |
|                                                                                                                                                        | 293.15 0.4                                        | 89 24191                                                    |
|                                                                                                                                                        |                                                   | 26 24425<br>64 24659                                        |
|                                                                                                                                                        | 308.15 0.6                                        | 03 24892                                                    |
| 313.15 0.6<br>318.15 0.6                                                                                                                               |                                                   | 44 25126<br>86 25359                                        |
|                                                                                                                                                        | 323.15 0.7                                        | 30 25593                                                    |
|                                                                                                                                                        | 328.15 0.7                                        | 74 25826                                                    |
|                                                                                                                                                        |                                                   |                                                             |
| AUXILIARY INFORMATION                                                                                                                                  |                                                   |                                                             |
|                                                                                                                                                        |                                                   |                                                             |
| The apparatus is based on the de-                                                                                                                      |                                                   | 1. Neon. Matheson Co., Research                             |
| the version used                                                                                                                                       | d is described by                                 | grade.                                                      |
| Clever, Battino                                                                                                                                        | , Saylor, and Gross (2)                           | 2. Iodobenzene. Eastman, white                              |
|                                                                                                                                                        |                                                   | thiosulfate, washed with water,                             |
| The solubility v                                                                                                                                       | values were adjusted to                           | dried over P <sub>4</sub> 0 <sub>10</sub> , distilled       |
| 101.325 kPa (1 a                                                                                                                                       | are of neon of<br>atm) by Henry's law.            | $77.40 - 77.60 ^{\circ}\text{C}$ (20 mmHg).                 |
| The Bunsen coef                                                                                                                                        | ficients were calcu-                              |                                                             |
| lated by the cor                                                                                                                                       | npiler.                                           |                                                             |
|                                                                                                                                                        |                                                   | ESTIMATED ERROR:                                            |
| APPARATUS/PROCEDURI                                                                                                                                    | E:<br>solvent is passed                           | $\delta T/K = 0.03$                                         |
| through a glass spiral tube containing                                                                                                                 |                                                   | $\delta P/mmHg = 1$<br>$\delta y / y = 0.04$                |
| the gas. The ga                                                                                                                                        | as dissolves rapidly<br>ed liquid flows into a    |                                                             |
| buret system. The volume of gas dis-<br>solved is determined by the increase<br>in the solution level at constant<br>pressure. The volume of liquid is |                                                   | REFERENCES:                                                 |
|                                                                                                                                                        |                                                   | 1. Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948. 2033. |
|                                                                                                                                                        |                                                   |                                                             |
| aetermined in th<br>solubilities ext                                                                                                                   | ne purets. For low<br>tra solvent is run          | 2. Clever, H.L.; Battino, R.;<br>Saylor, J.H.; Gross, P.M.  |
| through the bure                                                                                                                                       | et system and weighed.                            | J. Phys. Chem. 1957, 61, 1078.                              |
|                                                                                                                                                        |                                                   |                                                             |

| COMPONENTS:                                                                                                                            | ORIGINAL MEASUREMENTS:                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                 | POWEIL, R.J.                                                                                                       |
| 2. Carbon Disulfide; CS <sub>2</sub> ; 75-15-0                                                                                         |                                                                                                                    |
|                                                                                                                                        | J. Chem. Eng. Data 1972, 17, 302-304.                                                                              |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        |                                                                                                                    |
| VARIABLES:                                                                                                                             | PREPARED BY:                                                                                                       |
| P/kPa: 101.325 (1 atm)                                                                                                                 | P.L. Long                                                                                                          |
|                                                                                                                                        |                                                                                                                    |
| EXPERIMENTAL VALUES:                                                                                                                   |                                                                                                                    |
| T/K Mol Fraction Bunse<br>Coeffic                                                                                                      | n Ostwald R $\frac{\Delta \log X_1}{\Delta \log T} = N$                                                            |
| $x \times 10^4$ g x 1                                                                                                                  | $0^2$ L x $10^2$                                                                                                   |
| $\frac{1}{1}$                                                                                                                          |                                                                                                                    |
|                                                                                                                                        | 2.38                                                                                                               |
| The author states that solubility mea<br>313.15 K, but only the solubility at<br>slope $R(\Delta \log X_1/\Delta \log T)$ was given. T | surements were made between 288.15 and 298.15 K was given in the paper. The he smoothed data below were calculated |
| by the compiler from the slope in the                                                                                                  | form:                                                                                                              |
| $\log x_1 = \log(0.59 \times 10^{\circ})$                                                                                              | -4) + (8.0/R) log (T/298.15)                                                                                       |
| with $R = 1.9872$ cal $K^{-1}$ mol <sup>-1</sup> .                                                                                     |                                                                                                                    |
| Smoothed Data: T/K                                                                                                                     | Mol Fraction                                                                                                       |
|                                                                                                                                        | $x, \times 10^4$                                                                                                   |
|                                                                                                                                        |                                                                                                                    |
| 273.15<br>278.15                                                                                                                       | 0.41                                                                                                               |
| 283.15                                                                                                                                 | 0.48                                                                                                               |
| 200.15                                                                                                                                 | 0.55                                                                                                               |
| 298.15                                                                                                                                 | 0.59                                                                                                               |
|                                                                                                                                        | 0.05                                                                                                               |
| The Bunsen and Ostwald coefficients w                                                                                                  | ere calculated by the compiler.                                                                                    |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        |                                                                                                                    |
| AUXILIAR                                                                                                                               | ( INFORMATION                                                                                                      |
| METHOD:                                                                                                                                | SOURCE AND PURITY OF MATERIALS:                                                                                    |
|                                                                                                                                        | 1. Neon. No source given. Research                                                                                 |
|                                                                                                                                        | use.                                                                                                               |
|                                                                                                                                        | 2 Carbon digulfido No gourgo                                                                                       |
|                                                                                                                                        | given. Spectrochemical grade.                                                                                      |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        | ESTIMATED ERROR:                                                                                                   |
| Dymond and Hildebrand (1) apparatu                                                                                                     | s $\delta N/cal K mol^{+} = 0.1$                                                                                   |
| which uses an all glass pumping syste<br>to spray slugs of degassed solvert                                                            | n                                                                                                                  |
| into the gas. The amount of gas dis-                                                                                                   |                                                                                                                    |
| solved is calculated from the initial                                                                                                  | REFERENCED;                                                                                                        |
| and final gas pressures. The solvent is degassed by freezing and pumping                                                               | 1. Dymond, J.H.; Hildebrand, J.H.<br>Ind. Eng. Chem. Fundam. 1967. 6                                               |
| followed by boiling under reduced                                                                                                      | 130.                                                                                                               |
| pressure.                                                                                                                              |                                                                                                                    |
|                                                                                                                                        |                                                                                                                    |
|                                                                                                                                        | 1                                                                                                                  |

| COMPONENTS:                                                                                                                   | ORIGINAL MEASUREMENTS:                                     |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                        | Dymond, J.H.                                               |
| <pre>2. Sulfinylbismethane (Dimethyl Sulfoxide); C<sub>2</sub>H<sub>6</sub>OS (CH<sub>3</sub>SOCH<sub>3</sub>); 67-68-5</pre> | <u>J. Phys</u> . <u>Chem</u> . 1967, <u>71</u> ,1829-1831. |
|                                                                                                                               |                                                            |
| VARTARIES                                                                                                                     | DDEDADED DV.                                               |
| т/К: 298.15                                                                                                                   | r REFARED DI:                                              |
| P/kPa: 101.325 (1 atm)                                                                                                        | M.E. Derrick                                               |
| ,                                                                                                                             |                                                            |
|                                                                                                                               |                                                            |
| EXPERIMENTAL VALUES:                                                                                                          |                                                            |
| T/K Mol Fraction                                                                                                              | Bunsen Ostwald                                             |
|                                                                                                                               | Coefficient Coefficient                                    |
| v 10 <sup>4</sup>                                                                                                             | $10^2$ $10^2$                                              |
|                                                                                                                               |                                                            |
| 298.15 0.368                                                                                                                  | 1.16 1.27                                                  |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
| The Bunsen and Ostwald coefficients we                                                                                        | ere calculated by the compiler.                            |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
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|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
| AUXILIARY                                                                                                                     | INFORMATION                                                |
|                                                                                                                               |                                                            |
| METHOD /APPARATUS/PROCEDURE:                                                                                                  | SOURCE AND PURITY OF MATERIALS:                            |
| The liquid is saturated with the                                                                                              | 1. Neon. Matheson Co. Dried.                               |
| gas at a gas partial pressure of                                                                                              |                                                            |
| l atm.                                                                                                                        | 2. Dimethyl Sulfoxide. Matheson,                           |
| The apparatus is that described by                                                                                            | Coleman, and Bell Co. Spectro-                             |
| lapparatus uses an all-glass pumping                                                                                          | fraction frozen out Melting                                |
| system to spray slugs of degassed                                                                                             | nt.: 18.37°C.                                              |
| solvent into the gas. The amount of                                                                                           |                                                            |
| gas dissolved is calculated from the                                                                                          | }                                                          |
| initial and final gas pressure.                                                                                               |                                                            |
|                                                                                                                               |                                                            |
| <b>j</b>                                                                                                                      |                                                            |
|                                                                                                                               | ESTIMATED ERROR:                                           |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
|                                                                                                                               |                                                            |
|                                                                                                                               | DEFEDENCES.                                                |
|                                                                                                                               | KEFEKENCES:                                                |
|                                                                                                                               | 1. Dymond., J.; Hildebrand. J.H.                           |
| 1                                                                                                                             | Ind. Eng. Chem. Fundam. 1967,                              |
| 1                                                                                                                             | <u>6, 130.</u>                                             |
|                                                                                                                               |                                                            |
| 1                                                                                                                             |                                                            |
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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                      | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                              |
| 1. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                           | Friedman, H.L.                                                                                                                                                                                                                                      |
| 2. Nitromethane; CH <sub>3</sub> NO <sub>2</sub> ; 75-52-5                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                  | J. Am. Chem. Soc. 1954, 76, 3294-3297.                                                                                                                                                                                                              |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                       | PREPARED BY:                                                                                                                                                                                                                                        |
| T/K: 298.00<br>P/kPa: 101.325 (1 atm)                                                                                                                                                                                                                                                                                                                                            | P.L. Long                                                                                                                                                                                                                                           |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                     |
| T/K Mol Fraction                                                                                                                                                                                                                                                                                                                                                                 | Bunsen Ostwald                                                                                                                                                                                                                                      |
| $x_1 \times 10^4$                                                                                                                                                                                                                                                                                                                                                                | Coefficient Coefficient<br>αx10 <sup>2</sup> Lx10 <sup>2</sup>                                                                                                                                                                                      |
| 298.00                                                                                                                                                                                                                                                                                                                                                                           | 2.41<br>2.49                                                                                                                                                                                                                                        |
| 0.540                                                                                                                                                                                                                                                                                                                                                                            | 0.225 2.45 av.                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                     |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                                        | INFORMATION                                                                                                                                                                                                                                         |
| METHOD:<br>Gas absorption. The method was<br>essentially that employed by Eucken<br>and Herzberg (1). Modifications in-<br>cluded a magnetic stirring device in-<br>stead of shaking the saturation ves-<br>sel, and balancing the gas pressure<br>against a column of mercury with<br>electrical contacts instead of balanc-<br>ing the gas pressure against the<br>atmosphere. | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Air Reduction Co. Reagent<br/>grade, 99.8 per cent pure by mass<br/>spectroscopy.</li> <li>2. Nitromethane. Source not given.<br/>Distilled, dried by filtering at<br/>253 K.</li> </ul> |
| APPARATUS/PROCEDURE: The selvent was de                                                                                                                                                                                                                                                                                                                                          | ESTIMATED ERROR:                                                                                                                                                                                                                                    |
| gassed by vacuum. The procedure, re-<br>peated 5-10 times, was to alternate<br>5-15 s evacuation and rapid stirring<br>to produce cavitation. In the solu-<br>bility measurement gas pro-saturated                                                                                                                                                                               | $\delta P/mHg = 0.3$<br>$\delta L/L = 0.03$<br>REFERENCES:                                                                                                                                                                                          |
| with solvent vapor, was brought into<br>contact with about 80 ml of solvent in<br>the saturation vessel. Initial condi-<br>tions were established by a time ex-<br>trapolation. Solubility equilibrium<br>was approached from both under- and<br>supersaturation by varying the rate.                                                                                            | 1. Euken, A.; Herzberg, G.<br>Z. Phys. Chem. 1950, 195, 1.                                                                                                                                                                                          |

| COMPONENTS:                                                                                                                                            |                       |                          | ORIGINAL MEASUREMENTS:                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------|------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                 |                       |                          | Saylor, J.H.; Battino, R.                |
| 2. Nitrobenzene; C <sub>2</sub> H <sub>2</sub> NO <sub>2</sub> ; 98-95-3                                                                               |                       | 2; 98-95-3               |                                          |
|                                                                                                                                                        | 0.5                   |                          | J. Phys. Chem. 1958, 62, 1334-1337.      |
|                                                                                                                                                        |                       |                          | <u></u>                                  |
|                                                                                                                                                        |                       |                          |                                          |
| VARIABLES:                                                                                                                                             |                       |                          | PREPARED BY:                             |
| Т/К: 2                                                                                                                                                 | 288.15 -              | 328.15                   | H.L. Clever                              |
| P/kPa: 1                                                                                                                                               | L01.325 (             | l atm)                   |                                          |
| EXPERIMENTAL VALUES                                                                                                                                    | 5:                    |                          |                                          |
| [                                                                                                                                                      | т7к                   | Mol Fraction             | Bunsen Ostwald                           |
|                                                                                                                                                        |                       | x x 10 <sup>4</sup>      | $\sim 10^2$ L v $10^2$                   |
|                                                                                                                                                        |                       | <u></u>                  |                                          |
|                                                                                                                                                        | 288.15                | 0.317                    | 0.698 0.736                              |
|                                                                                                                                                        | 313.15                | 0.509                    | 1.12 $1.221.24$ $1.42$                   |
|                                                                                                                                                        | 328.15                | 0.676                    | 1.44 1.73                                |
| Smoothed Data:                                                                                                                                         | ∆G <sup>O</sup> /J mo | $1^{-1} = - RT \ln 2$    | $x_1 = 13274 + 38.974 T$                 |
|                                                                                                                                                        | Std. Dev              | $\Delta G^{O} = 300.4$   | - Coef. Corr. = 0.9152                   |
|                                                                                                                                                        |                       | $1^{-1} = 13274$         | $S^{0}/I \kappa^{-1} mol^{-1} = -38.974$ |
|                                                                                                                                                        |                       |                          |                                          |
|                                                                                                                                                        |                       | T/K Mol Fra              | ction ∆G /J mol                          |
|                                                                                                                                                        | _                     | <u> </u>                 | <u>10'</u>                               |
|                                                                                                                                                        | 2                     | 88.15 0.3                | 61 24505                                 |
|                                                                                                                                                        | 2                     | 93.15 0.3                | 97 24700<br>35 24895                     |
|                                                                                                                                                        | 3                     | 03.15 0.4                | 75 25089                                 |
|                                                                                                                                                        | 3                     | 08.15 0.5                | 18 25284                                 |
| 313.15 0.5<br>318.15 0.6                                                                                                                               |                       | 18.15 0.6                | 09 25674                                 |
| 323.15 0.6                                                                                                                                             |                       | 23.15 0.6                | 58 25869                                 |
|                                                                                                                                                        | 3                     | 28.15 0.7                | 10 26064                                 |
|                                                                                                                                                        |                       |                          |                                          |
|                                                                                                                                                        |                       | AUXILIARY                | INFORMATION                              |
| METHOD                                                                                                                                                 |                       |                          | SOURCE AND PURITY OF MATERIALS:          |
| The apparatus is based on the de-                                                                                                                      |                       | d on the de-             | 1. Neon. Matheson Co., Research          |
| sign by Morrison                                                                                                                                       | and Bil               | lett(1) and              | grade.                                   |
| the version used is described by<br>Clever, Batting, Saylor, and Gross (2)                                                                             |                       | and Gross (2).           | 2. Nitrobenzene. Eastman. white          |
|                                                                                                                                                        | 2 V                   |                          | label. Distilled from $P_4O_{10}$ ,      |
| The solubility v                                                                                                                                       | values we             | re adjusted to           | reduced pressure of 10 mm of Hg,         |
| a partial pressure of neon of                                                                                                                          |                       | eon of                   | b.p. 81.0 - 81.2°C.                      |
| 101.325 kPa (1 a                                                                                                                                       | atm) by H             | enry's law.              | 1                                        |
| The Bunsen coeff                                                                                                                                       | ficients              | were calcu-              |                                          |
| lated by the con                                                                                                                                       | mpiler.               |                          |                                          |
| APPARATUS/PROCEDURE:                                                                                                                                   |                       |                          | ESTIMATED ERROR:                         |
| The degassed solvent is passed                                                                                                                         |                       | is passed                | $\delta P/mHg = 1$                       |
| through a glass spiral tube containing                                                                                                                 |                       | ube containing           | $\delta x_1 / x_1 = 0.04$                |
| and the saturated liquid flows into a                                                                                                                  |                       | flows into a             | DEEEDENCEC.                              |
| buret system. The volume of gas dis-<br>solved is determined by the increase<br>in the solution level at constant<br>pressure. The volume of liquid is |                       | e of gas dis-            | 1. Morrison, T.J.: Billett. F.           |
|                                                                                                                                                        |                       | cne increase<br>constant | J. <u>Chem.</u> Soc. 1948, 2033.         |
|                                                                                                                                                        |                       | liquid is                | 2. Clever, H.L.: Battino R .             |
| determined in th                                                                                                                                       | e burets              | . For low                | Saylor, J.H.; Gross, P.M.                |
| through the bure                                                                                                                                       | t system              | and weighed.             | J. Phys. Chem. 1957, <u>61</u> , 1078.   |
| Į                                                                                                                                                      |                       |                          |                                          |

| COMPONENTS:                                                                                                                                                                 | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                                                                                                                      | Powell, R.J.                                                                                                                                                                                                                               |
| <pre>2. 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-<br/>bis(nonafluorobuty1)-1-butanamine<br/>(Perfluorotributylamine);C12F27N;<br/>311-89-7.</pre>                                   | <u>J. Chem. Eng. Data</u> 1972, <u>17</u> , 302-304.                                                                                                                                                                                       |
| VARIABLES:                                                                                                                                                                  | PREPARED BY:                                                                                                                                                                                                                               |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)                                                                                                                                       | P.L. Long                                                                                                                                                                                                                                  |
| EXPERIMENTAL VALUES:                                                                                                                                                        |                                                                                                                                                                                                                                            |
| T/K Mol Fraction Bunser                                                                                                                                                     | $\Delta$ Ostwald $\sum_{n} \Delta \log X_{1} = N$                                                                                                                                                                                          |
| Coeffici                                                                                                                                                                    | Lent Coefficient $\bigwedge \Delta \log T = N$                                                                                                                                                                                             |
| $ \frac{X_1 \times 10^4}{\alpha \times 10^4}$                                                                                                                               | $\frac{1}{2}$ <u>L x 10<sup>2</sup></u>                                                                                                                                                                                                    |
| 298.15 16.79 10.5                                                                                                                                                           | 11.5 2.76                                                                                                                                                                                                                                  |
| The author states that solubility meas 313.15 K, but only the solubility at 2 slope $R(\Delta \log x_1/\Delta \log T)$ was given. The by the compiler from the slope in the | surements were made between 288.15 and<br>298.15 K was given in the paper. The<br>a smoothed data below were calculated<br>form:                                                                                                           |
|                                                                                                                                                                             | -4.                                                                                                                                                                                                                                        |
| $\log X_1 = \log(16.79 \times 10)$                                                                                                                                          | ') +(2.76/R) log(T/298.15)                                                                                                                                                                                                                 |
| with $R = 1.9872$ cal $K^{-1}$ mol <sup>-1</sup> .                                                                                                                          |                                                                                                                                                                                                                                            |
| Smoothed Data:                                                                                                                                                              |                                                                                                                                                                                                                                            |
| T/K M                                                                                                                                                                       | ol Fraction                                                                                                                                                                                                                                |
|                                                                                                                                                                             | $x_1 \times 10^4$                                                                                                                                                                                                                          |
| 288.15                                                                                                                                                                      | 16.0                                                                                                                                                                                                                                       |
| 293.15                                                                                                                                                                      | 16.4                                                                                                                                                                                                                                       |
| 303.15                                                                                                                                                                      | 17.2                                                                                                                                                                                                                                       |
| 308.15                                                                                                                                                                      | 17.6                                                                                                                                                                                                                                       |
| 313.15<br>318.15                                                                                                                                                            | 18.0                                                                                                                                                                                                                                       |
| The Bunsen and Ostwald coefficients we                                                                                                                                      | ere calculated by the compiler.                                                                                                                                                                                                            |
| AUXILIARY                                                                                                                                                                   | INFORMATION                                                                                                                                                                                                                                |
| METHOD:                                                                                                                                                                     | SOURCE AND PURITY OF MATERIALS.                                                                                                                                                                                                            |
|                                                                                                                                                                             | <ol> <li>Neon. No source given. Research<br/>grade, dried over CaCl<sub>2</sub> before<br/>use.</li> </ol>                                                                                                                                 |
|                                                                                                                                                                             | <pre>2. Perfluorotributylamine. Minnesota<br/>Mining &amp; Manufacturing Co. Dis-<br/>tilled, used portion boiling be-<br/>tween 447.85-448.64 K which gave<br/>a single GLC peak.<br/>d<sub>298.15</sub> = 1.880 g cm<sup>-3</sup>.</pre> |
| APPARATUS/PROCEDURE:                                                                                                                                                        | ESTIMATED ERROR:                                                                                                                                                                                                                           |
| Dymond and Hildebrand (1) apparatus<br>which uses an all glass pumping system<br>to spray slugs of degassed solvent in-                                                     | $\delta N/cal K - mol 2 = 0.1 \delta X_1/X_1 = 0.002$                                                                                                                                                                                      |
| to the gas. The amount of gas dis-                                                                                                                                          | REFERENCES:                                                                                                                                                                                                                                |
| and final gas pressures. The solvent<br>is degassed by freezing and pumping<br>followed by boiling under reduced<br>pressure.                                               | <ol> <li>Dymond, J.H.; Hildebrand, J.H.<br/><u>Ind. Eng. Chem. Fundam</u>. 1967, <u>6</u>,<br/>130.</li> </ol>                                                                                                                             |
|                                                                                                                                                                             |                                                                                                                                                                                                                                            |

| COMPONENTS :                                              | OPTCINAL MEASUPEMENTS.                                                |
|-----------------------------------------------------------|-----------------------------------------------------------------------|
| COM ONEMIS.                                               | Wilcock D. T. Mousle T. L.                                            |
| 1. Neon; Ne; 7440-01-9                                    | Battino, B.; Wilhelm, E.                                              |
| 2. Octamethylcyclotetrasiloxane;                          | Fluid Phase Equilib.1978. 2. 225-230.                                 |
| $C_{8}H_{24}O_{4}Si_{4}; 556-67-2$                        |                                                                       |
| 0 21 1 4                                                  |                                                                       |
|                                                           |                                                                       |
| VARIABLES:                                                | PREPARED BY:                                                          |
| т/к: 298.13                                               | II I. Olemen                                                          |
| P/kPa: 101.325 (1 atm)                                    | H.L. Clever                                                           |
| -                                                         |                                                                       |
| EXPERIMENTAL VALUES:                                      |                                                                       |
| T/K MOL Fraction                                          | Bunsen Ostwald<br>Coefficient Coefficient                             |
| $X_1 \times 10^{-1}$                                      | $10^2$ L m $10^2$                                                     |
|                                                           |                                                                       |
| 298.13 9.19                                               | 6.609 7.213                                                           |
| The solubility values were adjusted t kPa by Henry's law. | o a gas partial pressure of 101.325                                   |
|                                                           |                                                                       |
| The Bunsen coefficients were calculat                     | ea by the compiler.                                                   |
|                                                           |                                                                       |
|                                                           |                                                                       |
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|                                                           |                                                                       |
|                                                           |                                                                       |
|                                                           |                                                                       |
| AUXILIARY                                                 | INFORMATION                                                           |
|                                                           |                                                                       |
| TEINOD / AFFARAIOS/ FROCEDURE:                            | SOURCE AND PURITY OF MATERIALS:                                       |
| The apparatus is based on the de-                         | 1. Neon. Matneson Co., Inc.                                           |
| the version used is described by                          | 99.99.                                                                |
| Battino, Evans, and Danforth (2).                         | 2. Octamethylovolotetrasilovano                                       |
| The degassing apparatus and procedure                     | General Electric Co. Distilled                                        |
| are described by Battino, Banzhof,                        | density of 298.15 K was 0.9500                                        |
| Degassing. Up to 500 cm of sol-                           | g cm <sup>-3</sup> .                                                  |
| vent is placed in a flask of such                         | -                                                                     |
| size that the liquid is about 4 cm                        |                                                                       |
| acep. The iquid is rapidly stirred,                       |                                                                       |
| through a liquid N, trap until the                        |                                                                       |
| permanent das residual pressure                           | ESTIMATED ERROR:<br>$\delta T/K = 0.03$                               |
| drops to 5 microns.                                       | $\delta P/mmHg = 0.5$                                                 |
| Solubility Determination. The de-                         | $\delta X_1 / X_1 = 0.02$                                             |
| gassed solvent is passed in a thin                        |                                                                       |
| film down a glass spiral tube con-                        | REFERENCES:                                                           |
| vent vapor at a total pressure of                         | 1.Morrison, T.J.; Billett, F.                                         |
| one atm. The volume of gas absorbed                       | J. Chem. Soc. 1948, 2033.<br>2 Batting B. Flyans F. D. Danforth W. F. |
| is found by difference between the                        | J.Am.Oil Chem.Soc. 1968. 45. 830.                                     |
| initial and final volumes in the                          | 3. Battino, R.; Banzhof, M.; Bogan, M.;                               |
| lected in a tared flask and weighed                       | Wilhelm, E.                                                           |
| a carea rrabh ana werghea.                                | <u>Anal. Chem. 1971, 43, 806.</u>                                     |
|                                                           |                                                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                                                                         | ويستعدد والمتحد والمتح                                                                                                                      |                                                                                                                |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--|--|
| COMPONENTS:                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                |                                                                                                         | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                              |                                                                                                                |  |  |
| l. Neon; Ne; 7440-01-9                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                |                                                                                                         | Karasz, F.E.; Halsey, G.D.Jr.                                                                                                                                                                                                       |                                                                                                                |  |  |
| 2. Argon; Ar; 7440-37-1                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                                                                                         |                                                                                                                                                                                                                                     |                                                                                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                                                                         | T Ohan Dhun                                                                                                                                                                                                                         |                                                                                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                                                                         | J. Chem. Phys.                                                                                                                                                                                                                      | 1958, <u>29</u> , 173 - 179.                                                                                   |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                                                                         |                                                                                                                                                                                                                                     |                                                                                                                |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                |                                                                                                         | PREPARED BY:                                                                                                                                                                                                                        |                                                                                                                |  |  |
| T/K:                                                                                                                                                                                                                                                                                                                                                                                                     | 83.91 -                                                                        | 87.45                                                                                                   | P. L                                                                                                                                                                                                                                | . Long                                                                                                         |  |  |
| P/KPd:                                                                                                                                                                                                                                                                                                                                                                                                   | (4 - 14)                                                                       | cmHg)                                                                                                   |                                                                                                                                                                                                                                     |                                                                                                                |  |  |
| EXPERIMENTAL VAL                                                                                                                                                                                                                                                                                                                                                                                         | UES:                                                                           | -                                                                                                       |                                                                                                                                                                                                                                     | ·                                                                                                              |  |  |
| -                                                                                                                                                                                                                                                                                                                                                                                                        | т/к                                                                            | Henry's Constant                                                                                        | Mol Fraction                                                                                                                                                                                                                        |                                                                                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          | -,                                                                             |                                                                                                         | At Ne Pressure                                                                                                                                                                                                                      | At Ne Pressure                                                                                                 |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                | 10 K/CmHg                                                                                               | 1  cmHg<br>X <sub>1</sub> x $10^4$                                                                                                                                                                                                  | 76 cmHg<br>X, x 10 <sup>4</sup>                                                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                                                                         |                                                                                                                                                                                                                                     | <u> </u>                                                                                                       |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          | 83.91                                                                          | 8.38                                                                                                    | 0.119                                                                                                                                                                                                                               | 9.04                                                                                                           |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          | 84.54                                                                          | 8.39                                                                                                    | 0.119                                                                                                                                                                                                                               | 9.04                                                                                                           |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          | 86.11                                                                          | 8.00                                                                                                    | 0.125                                                                                                                                                                                                                               | 9.50                                                                                                           |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          | 87.45                                                                          | 7.66                                                                                                    | 0.131                                                                                                                                                                                                                               | 9.96                                                                                                           |  |  |
| I/T plot. The compiler took log K valu<br>graph to obtain the values of Henry's<br>compiler calculated the mole fraction<br>pressures of one and 76 cmHg from Henr<br>The Henry's constant is K/cmHg = (P <sub>1</sub> /cm<br>Smoothed Data: For the mole fraction s<br>$\Delta G^0/J \text{ mol}^{-1} = -RT \ln X_1$<br>Std. Dev. $\Delta G^0 = 5$ , Coe<br>$\Delta H^0/J \text{ mol}^{-1} = 1,731.5$ , |                                                                                |                                                                                                         | thes from the point<br>constant given in<br>solubility of nec<br>cy's law.<br>htg)/X <sub>1</sub> .<br>solubility values<br>= 1,731.5 + 37.<br>ef. Corr. = 0.9956<br>$\Delta$ S <sup>0</sup> /J K <sup>-1</sup> mol <sup>-1</sup> = | ts on the second<br>n the Table above. The<br>on in liquid argon at<br>at 76 cmHg.<br>.716 T<br>6<br>= -37.716 |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                | AUXILIARY                                                                                               | INFORMATION                                                                                                                                                                                                                         |                                                                                                                |  |  |
| METHOD:                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                                                                                         | SOURCE AND PURITY OF                                                                                                                                                                                                                | F MATERIALS:                                                                                                   |  |  |
| A measured                                                                                                                                                                                                                                                                                                                                                                                               | amount c                                                                       | of neon gas was                                                                                         | 1. Neon. Air Red                                                                                                                                                                                                                    | duction Co. Used as                                                                                            |  |  |
| placed in the<br>amount of liq<br>was recorded<br>amount of gas<br>function of to<br>Only the resu<br>runs are gives                                                                                                                                                                                                                                                                                     | cell wi<br>uid argo<br>as a fun<br>(isothe<br>emperatu<br>lts from<br>n above. | th a measured<br>on. The pressure<br>action of the<br>erm) or as a<br>are (isostere).<br>a the isotherm | <ul> <li>received in glass sealed bulbs.</li> <li>2. Argon. Air Reduction Co. Used as<br/>received in glass sealed bulbs for<br/>the reference. The actual solvent<br/>was tank argon purified with<br/>titanium metal.</li> </ul>  |                                                                                                                |  |  |
| APPARATUS /PROCED                                                                                                                                                                                                                                                                                                                                                                                        | URE :                                                                          | · · · · · · · · · · · · · · · · · · ·                                                                   | ESTIMATED ERROR:                                                                                                                                                                                                                    |                                                                                                                |  |  |
| A stainless<br>compartment for<br>compartment for                                                                                                                                                                                                                                                                                                                                                        | steel c<br>or the s<br>or pure                                                 | cell with one<br>colution and one<br>liquid argon as                                                    | δΤ/<br>δΡ/cmF<br>δX1/3                                                                                                                                                                                                              | K = 0.01<br>Hg = 0.002<br>$K_1 = 0.001$                                                                        |  |  |
| compartment for pure liquid argon as<br>a reference. The cell was suspended so<br>that movement in one direction by an<br>electromagnet agitated the solution.<br>The argon vapor pressure checked with<br>literature values (1).                                                                                                                                                                        |                                                                                |                                                                                                         | REFERENCES:<br>1. Mallett, M. W.<br><u>Ind. Eng. Chem</u> . 1950, <u>42</u> , 2045.                                                                                                                                                 |                                                                                                                |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                                                                         |                                                                                                                                                                                                                                     |                                                                                                                |  |  |

| COMPONENTS :                                                                    | ORIGINAL MEASUREMENTS:                          |
|---------------------------------------------------------------------------------|-------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                          | Ikels, K. G.                                    |
| 2. Olive Oil                                                                    |                                                 |
|                                                                                 |                                                 |
|                                                                                 | Technical Report<br>SAM-TDR-64-28, May 1964     |
| VARIABLES:                                                                      | PREPARED BY:                                    |
| T/K: 310.75<br>Total P/kPa: 101.325 (1 atm)                                     | P. L. Long                                      |
| EXPERIMENTAL VALUES:                                                            |                                                 |
| $\frac{T/K}{210.75}$ Bunsen<br>Coefficie<br>$\frac{\alpha \times 10^2}{210.75}$ | Ostwald<br>Coefficient<br>$L \times 10^2$       |
| <u> </u>                                                                        | 077 2.20                                        |
| The Bunsen coefficient uncertainty is                                           | the standard deviation.                         |
| The Ostwald coefficient was calculate                                           | d by the compiler.                              |
|                                                                                 |                                                 |
|                                                                                 |                                                 |
|                                                                                 |                                                 |
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|                                                                                 |                                                 |
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|                                                                                 |                                                 |
|                                                                                 |                                                 |
| AUXILIARY                                                                       | INFORMATION                                     |
| METHOD:                                                                         | SOURCE AND PURITY OF MATERIALS:                 |
| Van Slyke-gas chromatograph appa-                                               | 1. Neon, No source given. Research              |
| ratus (1). Equilibration apparatus                                              | grade.                                          |
| to which a small water manometer was                                            | 2. Olive oil.                                   |
| degassed in vacuo in the Van Slyke                                              |                                                 |
| apparatus, gas was added, and the system agitated until equilibrium was         |                                                 |
| reached. The saturated gas-liquid                                               |                                                 |
| apparatus to the gas chromatograph                                              |                                                 |
| where the solubility was measured by the peak size. Known volumes of a          | ESTIMATED ERROR:                                |
| reference gas were used before and                                              |                                                 |
| was calibrated with water.                                                      |                                                 |
|                                                                                 | REFERENCES:                                     |
|                                                                                 | 1. Ikels, K. G.<br>SAM-TDR-64-1. February 1964. |
|                                                                                 |                                                 |
|                                                                                 |                                                 |
|                                                                                 |                                                 |

| COMPONENTS :       |                                             | ORIGINAL MEASUREMENTS:                                            |  |  |  |
|--------------------|---------------------------------------------|-------------------------------------------------------------------|--|--|--|
| 1. Neon; Ne;       | 7440-01-9                                   | Battino, R.; Evans, F. D.;                                        |  |  |  |
|                    |                                             | Danforth, W. F.                                                   |  |  |  |
| 2. Olive Oil       |                                             |                                                                   |  |  |  |
|                    |                                             |                                                                   |  |  |  |
| 1                  |                                             | J. Am. Oil Chem. Soc. 1968, 45,                                   |  |  |  |
|                    |                                             | 830 - 833.                                                        |  |  |  |
| VARIABLES:         |                                             | PREPARED BY:                                                      |  |  |  |
| Т/К:               | 297.67 - 328.00                             | H. L. Clever                                                      |  |  |  |
| P/kPa:             | 101.325 (1 atm)                             |                                                                   |  |  |  |
|                    |                                             |                                                                   |  |  |  |
| EXPERIMENTAL VALUE | 25:                                         |                                                                   |  |  |  |
| 1                  |                                             | Dun con Octure 1.4                                                |  |  |  |
|                    | T/K MOL Fraction                            | Coefficient Coefficient                                           |  |  |  |
|                    | $x_{1} \times 10^{4}$                       | $\alpha \times 10^2$ L x $10^2$                                   |  |  |  |
|                    | 207.67 0.54                                 | 1.05 2.12                                                         |  |  |  |
|                    | 297.07 8.54                                 | 1.957 $2.1331.980$ $2.160$                                        |  |  |  |
|                    | 307.90 8.53                                 | 1.944 2.191                                                       |  |  |  |
| 1                  | 308.15 8.43                                 | 1.922 2.169                                                       |  |  |  |
|                    | 318.65 8.30                                 | $1.88_2$ $2.19_6$                                                 |  |  |  |
|                    | 328.00 8.17                                 | 1.844 2.207                                                       |  |  |  |
| Smoothed Data      | $\wedge G^{\circ}/I = - RT In$              | $x_{-} = -1359.7 + 63.245 \text{ m}$                              |  |  |  |
| biilootiica bata.  |                                             |                                                                   |  |  |  |
|                    | Std. Dev. $\Delta G^{\circ} = 14.8$ ,       | Coef. Corr. = 0.9998                                              |  |  |  |
|                    | $\Delta H^{\circ}/J mol^{-1} = -1.359.7$    | $AS^{\circ}/J K^{-1} mol^{-1} = -63.245$                          |  |  |  |
|                    |                                             |                                                                   |  |  |  |
|                    |                                             | ··· · · · · · · · · · · · · · · · · ·                             |  |  |  |
|                    | T/K MOL Frac                                | $^{100}$ $\Delta G^{\circ}/J$ mol $^{-1}$                         |  |  |  |
|                    |                                             | · · · · · · · · · · · · · · · · · · ·                             |  |  |  |
|                    | 293.15 8.68                                 | 17,181                                                            |  |  |  |
|                    | 303.15 8.53                                 | 17.813                                                            |  |  |  |
|                    | 308.15 8.45                                 | 18,129                                                            |  |  |  |
|                    | 313.15 8.38                                 | 18,445                                                            |  |  |  |
|                    | 318.15 8.31<br>323.15 8.25                  | 18,762                                                            |  |  |  |
| [                  | 328.15 8.18                                 | 19,394                                                            |  |  |  |
|                    | AUXILIARY                                   | INFORMATION                                                       |  |  |  |
|                    |                                             | COUDOR AND DUDING OD MANDELLE                                     |  |  |  |
| design by Morr     | iratus is based on the ison and Billett (1) | L. Neon, Matheson Co., Inc.                                       |  |  |  |
| and the versio     | on used is a modificatio                    | n 99.995 Min. Vol & Purity.                                       |  |  |  |
| of the apparat     | us of Clever, Battino,                      |                                                                   |  |  |  |
| Saylor and Gro     | oss (2).                                    | 2. Olive oli. A. U.S.P., Fisher<br>Scientific Company. 0.58% free |  |  |  |
|                    |                                             | fatty acid.                                                       |  |  |  |
|                    |                                             | B. Nutritional Biochemicals                                       |  |  |  |
| APPARATUS/PROC     | EDURE: Degassing.                           | Corp., 0.30% free fatty acid.                                     |  |  |  |
| ated chamber o     | f an all glass appara-                      | fitted to the equation $\alpha/g \text{ cm}^{-3}$                 |  |  |  |
| tus; it is sti     | rred and heated until                       | = 0.9152 - 0.000468t/C. The aver-                                 |  |  |  |
| the pressure d     | rops to the vapor                           | age mol wt is 884 ± 45.                                           |  |  |  |
| pressure of th     | e liquid. Solubility                        | ESTIMATED ERROR:                                                  |  |  |  |
| passes in a th     | in film down a glass                        | $\delta T / K = 0.03$                                             |  |  |  |
| spiral tube at     | a total pressure of                         | $\delta P/mmHg = 0.5$                                             |  |  |  |
| one atm of sol     | ute gas plus solvent                        | $\delta x_1 / x_1 = 0.01$                                         |  |  |  |
| vapor. The ga      | s absorbed is measured                      | REFEDENCES.                                                       |  |  |  |
| solvent is col     | lected in a tared                           | MERINGES:                                                         |  |  |  |
| flask and weig     | hed.                                        | 1. Morrison, T. J.; Billett, F.                                   |  |  |  |
| -                  |                                             | J. Chem. Soc. 1948, 2033.                                         |  |  |  |
|                    |                                             | 2. Clever, H. L.: Battino, R.:                                    |  |  |  |
|                    |                                             | Saylor, J. H.; Gross, P. M.                                       |  |  |  |
|                    |                                             | J, Phys. Chem. 1957, 61, 1078.                                    |  |  |  |
|                    |                                             |                                                                   |  |  |  |

| COMPONENTS:                                                             | ORIGINAL MEASUREMENTS:                                         |
|-------------------------------------------------------------------------|----------------------------------------------------------------|
| 1. Neon; Ne; 7440-01-9                                                  | Ikels, K. G.                                                   |
| 2. Human Fat (pooled)                                                   |                                                                |
|                                                                         | Machaical Deport                                               |
|                                                                         | SAM-TDR-64-28, May 1964.                                       |
| VARIABLES:                                                              | PREPARED BY:                                                   |
| T/K: 310.75                                                             | P. L. Long                                                     |
| Total P/kPa: 101.325 (1 atm)                                            |                                                                |
| EXPERIMENTAL VALUES:                                                    |                                                                |
| T/K Bunsen                                                              | Ostwald                                                        |
| Coefficia<br>a x 10                                                     | ent Coefficient<br>2 L x 10 <sup>2</sup>                       |
|                                                                         |                                                                |
| 310:75 1:972 ±                                                          |                                                                |
| The Bunsen coefficient uncertainty is                                   | the standard deviation.                                        |
|                                                                         |                                                                |
| The Ostwald coefficient was calculated                                  | d by the compiler.                                             |
|                                                                         |                                                                |
|                                                                         |                                                                |
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|                                                                         |                                                                |
| AUXILIARY                                                               | INFORMATION                                                    |
| METHOD:                                                                 | SOURCE AND PURITY OF MATERIALS:                                |
| Van Slyke-gas chromatograph appa-                                       | 1. Neon. No source given. Research                             |
| ratus (1). Equilibration apparatus                                      | grade.                                                         |
| to which a small water manometer was                                    | []                                                             |
| attached. The sample material was<br>degassed in vacuo in the Van Slyke |                                                                |
| apparatus, gas was added, and the                                       |                                                                |
| system agitated until equilibrium was reached. The saturated gas-liquid |                                                                |
| sample was passed from the Van Slyke                                    |                                                                |
| where the solubility was measured by                                    | ESTIMATED ERROR:                                               |
| the peak size. Known volumes of a reference gas were used before and    |                                                                |
| after each run. The chromatograph was                                   |                                                                |
| callbrated with water.                                                  |                                                                |
|                                                                         | REFERENCES:                                                    |
|                                                                         | <pre>1. Ikels, K. G.<br/>SAM-TDR-64-1, February 1964.</pre>    |
|                                                                         |                                                                |
|                                                                         |                                                                |
|                                                                         |                                                                |
| Callbrated with water.                                                  | REFERENCES:<br>1. Ikels, K. G.<br>SAM-TDR-64-1, February 1964. |
|                                                                         |                                                                |

HELIUM AND NEON SOLUBILITIES ABOVE 2 BAR

Ceneral Remarks for High Pressure Solubility Studies on Mixtures Containing Helium or Neon

Mixtures containing helium often exhibit the phenomenon referred to as gas-gas immiscibility (1). This has led to a number of studies in which the solubility data of helium in a less volatile component are presented in a graphical form or are, in general of very low precision.

The following remarks on mixtures (a) studied primarily for investigating gas-gas immiscibility or (b) studied by only one or two groups of workers but at several temperatures and pressure, are included to increase the usefulness and comprehensibleness of the compiled tables.

### Helium and Dichlorodifluoromethane

This system was investigated by Tsiklis, Maslennikova and Goryunova (?) primarily to establish that it exhibited gas-gas immiscibility of the first kind. The data are of fairly low accuracy and are classified as tentative.

## Helium + Carbon Monoxide

This system has been investigated by Parrish and Stewart (3) and by Sinor and Kurata (4). Although slightly different temperature ranges were used the data interpolated to the same temperatures are in good agreement. The two sets are therefore classified as tentative.

## Helium + Ethane

This system has been investigated by Nikitina and coworkers (5). There is little on which to base a meaningful evaluation and hence these data are classified as tentative.

## Helium + Propane

This system has only been investigated by Schindler and coworkers (6). There is little evidence on which to base a meaningful evaluation and hence these data are classified as tentative.

## Helium + Fluorine

The only data published on these systems are those of Cannon and Crane (7) which are not of high precision. They are classified as tentative.

#### Helium + Krypton

The only data published on this system are those of Kidnay  $et \ al$ . (8) which are classified as tentative. Other measurement on similar systems by this group are thought to be of good accuracy.

# Helium-4 + Deuterium

Helium-3 + Deuterium

Hiza's data (9) are the only measurements on the solubility for these two systems and hence both sets of data are classified as tentative. Hiza's

data on the corresponding helium + hydrogen system appear to be reliable.

## Helium + Nitrous Oxide

The only data published on this system are those of Parrish and Stewart (3) which are classified as tentative.

#### Helium + Xenon

The data of De Swaan Arons and Diepen (10) are bubble point-dew point data at fixed composition and are not in usual form of solubility data. They were determined to establish the existence of gas-gas immiscibility in this system and are classified as tentative.

Helium + Methanol

- Helium + n-Hexane
- Helium + Benzene
- Helium + Sulfur dioxide

These systems were studied by Tsiklis and Khodeeva (11) but no tabulated data were given. The primary purpose of the investigation was to establish whether these systems exhibited gas-gas immiscibility. All four systems were found to exhibit gas-gas immiscibility of the first type. For the present purpose the data are rejected because of their limited nature and low precision.

## Helium + Ammonia

The data of Hiese (12) for this system are limited in scope but classified as tentative. The data of Tsiklis (13) are rejected as they are only reported in graphical form and were determined to establish if this system exhibited gas-gas immiscibility. The data of Ipatieff and Teodorovich (14) are also rejected as they were determined by an inadequate technique. The data of Zakharova and coworkers (15) are also rejected because they are presented in a graphical form.

#### Neon + Methane

This system has only been studied by Streett and Hill (16). Their data are classified as tentative in view of the fact that other data from this group, where comparison with other workers' data is possible, appears to be reliable. This system exhibits gas-gas immiscibility and the barotropic or phase inversion phenomenon (17).

## References

- Schneider, G. M., in Chemical Thermodynamics Vol. 2 Specialist Periodical Report, Chapter 4, ed. McGlashan, M. L., Chemical Society, London, <u>1978</u>.
- Tsiklis, D. S., Maslennikova, V. Ya. and Goryunova, N. P., Zhur. Fiz. Chem., <u>1967</u>, 41, 1804.

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      Parrish, W. R. and Stewart, W. G., J. Chem. Engng. Data, 1975, 20, 412.
 4.
      Sinor, J. E. and Kurata, F., J. Chem. Engng. Data, 1966, 11, 537.
 5.
      Nikitina, I. E., Skripka, V. G., Gubkina, G. F., Sirotin, A. G. and
         Ben'yaminovic, O. A., Gazov. Prom., 1970, 15, no. 6, 35.
 6.
      Schindler, D. L., Swift, G. W. and Kurata, F., Hydrocarbon Process.,
         1966, 45, no. 11, 205.
 7.
      Cannon, W. A. and Crane, W. E., Cryogenic Tech., 1968, 4, 178.
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| COMPO | NENTS:                   |           | EVALUATOR:                |
|-------|--------------------------|-----------|---------------------------|
| 1.    | Helium; He;              | 7440-59-7 | Colin Young,              |
|       |                          |           | School of Chemistry,      |
| 2.    | Water; H <sub>2</sub> O; | 7732-18-5 | University of Melbourne,  |
|       |                          |           | Parkville, Victoria 3052, |
|       |                          |           | AUSTRALIA.                |

CRITICAL EVALUATION:

The experimental data of Wiebe and Gaddy (1) and Pray et al. (2) are classified as tentative whereas those of Gardiner and Smith (3) are recommended. Since there is no overlap in the temperature range a detailed comparison of the data of Pray et al. (2) with those of the other two groups is not possible. However, the data of Pray et al. (2) are thought to be of considerably lower accuracy than those of Wiebe and Gaddy and Gardiner and Smith (3). The data of Wiebe and Gaddy (1) are probably less accurate than the more recent data of Gardiner and Smith (3). In the latter work a correction for the effect of the meniscus curvature was taken into account which, the authors claim, could account for a slight discrepancy between their values and the earlier values of Wiebe and Gaddy (1). There is little doubt that Gardiner and Smith (2) are correct in applying this meniscus correction. Unfortunately only some of the experimental data are presented in the work of Gardiner and Smith (3), however, smoothing equations were given and these are those recommended below.

The data of Enns *et al*. (4) are not in agreement with either the work of Wiebe and Gaddy (1) or that of Gardiner and Smith (3) and are rejected.

### Smoothing Equations

323.15K  $x_{\text{He}} = 7.152 \times 10^{-6} P - 3.214 \times 10^{-9} P^2 + 3.3926 \times 10^{-12} P^3$ 373.15K  $x_{\text{He}} = 6.7624 \times 10^{-6} P - 2.5091 \times 10^{-9} P^2 + 2.4032 \times 10^{-12} P^3$ where P is pressure in units of bar (10<sup>5</sup> Pa)

## References

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- Pray, H. A., Schweickert, C. E. and Minnick, B. H., Ind. Eng. Chem., 1952, 44, 1146.
- 3. Gardiner, G. E. and Smith, N. O., J. Phys. Chem., 1972, 76, 1195.
- 4. Enns, T., Scholander, P. F. and Bradstreet, E. D., J. Phys. Chem., <u>1965</u>, 69, 389.

| COMPONENTS:                                                                                                                                                                                                                                                                                                                             | ORIGINAL MEASUREMENTS:                                                                                                                                |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| (1) Helium; He; 7440-59-7                                                                                                                                                                                                                                                                                                               | Wiebe, R. and Gaddy, V. L.,<br>J. Am. Chem. Soc., <u>1935</u> , 57, 847.                                                                              |  |  |  |
| (2) Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                  |                                                                                                                                                       |  |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                              | PREPARED BY:                                                                                                                                          |  |  |  |
| Temperature, pressure                                                                                                                                                                                                                                                                                                                   | C. L. Young                                                                                                                                           |  |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                       |  |  |  |
| 10 <sup>3</sup> Mole fraction<br>T/K P/bar of helium in water,<br>10 <sup>3</sup> x <sub>He</sub>                                                                                                                                                                                                                                       | 10 <sup>3</sup> Mole fraction<br>T/K P/bar of helium in water,<br>10 <sup>3</sup> <sup>x</sup> He                                                     |  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                    | $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                  |  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                    | $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                       |  |  |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                               | INFORMATION                                                                                                                                           |  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>One pass flow method with two vessel<br>adsorption train. Second vessel<br>used as source of sample for analysis<br>Pressure maintained with dead weight<br>gauges. Measurements taken both<br>for a high pressure and low pressure<br>approach to equilibrium. Details<br>in source and refs. 1 and 2. | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Purity 99.95 mole per cent;<br/>Bureau of Mines sample.</li> <li>2. No details given.</li> </ul> |  |  |  |
|                                                                                                                                                                                                                                                                                                                                         | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.5\%;$                                                                                |  |  |  |
|                                                                                                                                                                                                                                                                                                                                         | He < 0.2% (estimated by compiler).                                                                                                                    |  |  |  |
|                                                                                                                                                                                                                                                                                                                                         | REFERENCES :                                                                                                                                          |  |  |  |
|                                                                                                                                                                                                                                                                                                                                         | 1. Wiebe, R., Gaddy, V. L. and<br>Heins, C., J. Am. Chem. Soc.,<br>1933, 55, 947.                                                                     |  |  |  |
|                                                                                                                                                                                                                                                                                                                                         | 2. wiebe, R., Gaddy, V. L. and<br>Heins, C., Ind. Eng. Chem., <u>1931</u> ,<br>23, 401.                                                               |  |  |  |

| COMPONENTS :                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                      |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
|                                                                                                                                                                                                                                                                                                                                                            | ORIGINAL MEASUREMENIS:                                                                                                                                                               |  |  |  |
| (1) Helium; He; 7440-59-7                                                                                                                                                                                                                                                                                                                                  | Gardiner, G. E. and Smith, N. O.,                                                                                                                                                    |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            | J. Phys. Chem., <u>1972</u> , 76, 1195.                                                                                                                                              |  |  |  |
| (2) Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                 | PREPARED BY:                                                                                                                                                                         |  |  |  |
| Temperature, pressure                                                                                                                                                                                                                                                                                                                                      | C. L. Young                                                                                                                                                                          |  |  |  |
| iemperature, pressure                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                      |  |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                      |  |  |  |
| $10^3$ Mole fraction of h                                                                                                                                                                                                                                                                                                                                  | elium                                                                                                                                                                                |  |  |  |
| T/K P/bar in liquid, 10 <sup>3</sup> a                                                                                                                                                                                                                                                                                                                     | Не                                                                                                                                                                                   |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
| 293.15 202.6 1.336                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| 298.15     202.6     1.323       303.15     202.6     1.324                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      |  |  |  |
| 308.15 202.6 1.329                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| 313.15         202.6         1.331           318.15         202.6         1.343                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
| 323.15 101.3 0.692                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| 323.15 202.6 1.363                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| 323.15 405.3 2.599                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| 323.15 506.6 3.236                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| 323.13 007.9 3.745                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| A+ 272 15 V                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      |  |  |  |
| <u>AL 373.15 K</u>                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |  |  |  |
| $x_{\rm He} = 6.7624 \times 10^{-6} \ P/bar - 2.5091 \times 10^{-9}$                                                                                                                                                                                                                                                                                       | $(P/bar)^{2} + 2.4032 \times 10^{-12} (P/bar)^{3}$ .                                                                                                                                 |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
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|                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                      |  |  |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                  | INFORMATION                                                                                                                                                                          |  |  |  |
| AUXILIARY                                                                                                                                                                                                                                                                                                                                                  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:                                                                                                                                       |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclaye (\4.51).                                                                                                                                                                                                                                                                                | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity                                                                                                     |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.                                                                                                                                                                                                                                       | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.                                                                            |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (~4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell                                                                                                                                                                   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas                                                                                                                            | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using                                                 | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (~4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in            | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.                                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.<br>ESTIMATED ERROR:                         |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. 2. Distilled and deionized. ESTIMATED ERROR:</pre> |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. 2. Distilled and deionized. ESTIMATED ERROR:</pre> |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. 2. Distilled and deionized. ESTIMATED ERROR:</pre> |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. 2. Distilled and deionized. ESTIMATED ERROR:</pre> |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. ESTIMATED ERROR:</pre>                             |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. 2. Distilled and deionized. ESTIMATED ERROR:</pre> |  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:<br>Large steel autoclave (v4.51).<br>Pressure measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with liquid, compressed gas<br>added. After equilibrium attained<br>samples removed and analysed using<br>volumetric techniques. Details in<br>ref. 1. | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. 2. Distilled and deionized. ESTIMATED ERROR:</pre> |  |  |  |

| COMPONENTS :                                                                                                                                                                                                                             | ORIGINAL MEASUREMENTS:                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| (l) Helium; He; 7440-59-7                                                                                                                                                                                                                | Pray, H. A. H., Schweichert, C. E.<br>and Minnich, B. H., Ind. Eng. Chem.,         |
| (2) Water; H <sub>2</sub> O; 7732-18-5                                                                                                                                                                                                   | <u>1952</u> , 44, 1147.                                                            |
|                                                                                                                                                                                                                                          |                                                                                    |
| VARIABLES:                                                                                                                                                                                                                               | PREPARED BY:                                                                       |
| Temperature, pressure                                                                                                                                                                                                                    | C. L. Young                                                                        |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                     |                                                                                    |
| 10 <sup>3</sup> Mole fraction of<br>T/K P/bar in water, 10 <sup>3</sup>                                                                                                                                                                  | helium<br><sup>x</sup> He                                                          |
| 435.9 6.89 0.14<br>13.79 0.22                                                                                                                                                                                                            |                                                                                    |
| 20.68         0.27           533.1         6.89         0.29           13.79         0.43                                                                                                                                                |                                                                                    |
| 20.68 0.71<br>27.58 0.99<br>34.47 1.26                                                                                                                                                                                                   |                                                                                    |
| 588.7 13.79 0.66<br>20.68 1.18                                                                                                                                                                                                           |                                                                                    |
| 27.58 1.78<br>34.47 2.13                                                                                                                                                                                                                 |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
| AUXILIARY                                                                                                                                                                                                                                | INFORMATION                                                                        |
| METHOD /APPARATUS/PROCEDURE:                                                                                                                                                                                                             | SOURCE AND PURITY OF MATERIALS:                                                    |
| Rocking equilibrium cell of 3 & capa-<br>city. Pressure measured with dead<br>weight gauge and temperature measured<br>using chromel-alumel thermocouple.<br>Cell contents equilibrated and liquid<br>sample removed. The amount of dis- | No details given.                                                                  |
| solved gas estimated volumetrically.                                                                                                                                                                                                     |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 1;  \delta x_{u_0} =$ |
|                                                                                                                                                                                                                                          | <pre>±1-5% (estimated by compiler).</pre>                                          |
|                                                                                                                                                                                                                                          | REFERENCES:                                                                        |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |
|                                                                                                                                                                                                                                          |                                                                                    |

| COMPONENTS :                           | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                         |  |  |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| (l) Helium; He; 7740-59-7              | Gardiner, G. E. and Smith, N. O.,                                                                                                                                                                                              |  |  |
| (2) Sodium chloride; NaCl; 7647-14-5   | J. Phys. Chem., <u>1972</u> , 76, 1195.                                                                                                                                                                                        |  |  |
| (3) Water; H <sub>2</sub> O; 7732-18-5 |                                                                                                                                                                                                                                |  |  |
|                                        |                                                                                                                                                                                                                                |  |  |
| VARIABLES:                             | PREPARED BY:                                                                                                                                                                                                                   |  |  |
| Temperature, pressure, composition     | C. L. Young                                                                                                                                                                                                                    |  |  |
|                                        |                                                                                                                                                                                                                                |  |  |
| EXPERIMENTAL VALUES:                   | te in Greething Republic                                                                                                                                                                                                       |  |  |
| Coefficien                             | ts in smoothing Equation $b \times 10^{-9}$ $c \times 10^{12}$                                                                                                                                                                 |  |  |
|                                        | -B × 10 * C × 10**                                                                                                                                                                                                             |  |  |
| 298.15 1.003m NaCl 5.694               | 1.273 0.239                                                                                                                                                                                                                    |  |  |
| 4.067m NaCl 3.283                      | 1.187 0.805                                                                                                                                                                                                                    |  |  |
| 4.067m NaCl 3.327                      | 1.346 0.757                                                                                                                                                                                                                    |  |  |
| 373.15 1.003m NaCl 5.262               | 1.351 1.299                                                                                                                                                                                                                    |  |  |
| 4.067m NaCl 4.056                      | 2.905 2.218                                                                                                                                                                                                                    |  |  |
|                                        |                                                                                                                                                                                                                                |  |  |
| AUXILIARY                              | INFORMATION                                                                                                                                                                                                                    |  |  |
| METHOD / APPARATUS / PROCEDURE :       | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                |  |  |
| Large steel cell (4.5 %). Pressure     | 1. Matheson Co. sample, purity 99.995                                                                                                                                                                                          |  |  |
| Temperature measured with iron-        | more per cent.                                                                                                                                                                                                                 |  |  |
| constantan thermocouple. Cell          | 2. Baker analysed reagent.                                                                                                                                                                                                     |  |  |
| charged with salt solution, com-       | 3. Distilled and de-ionised.                                                                                                                                                                                                   |  |  |
| librium attained, samples of liquid    |                                                                                                                                                                                                                                |  |  |
| removed and analysed using volu-       |                                                                                                                                                                                                                                |  |  |
| 1.                                     |                                                                                                                                                                                                                                |  |  |
|                                        |                                                                                                                                                                                                                                |  |  |
|                                        |                                                                                                                                                                                                                                |  |  |
|                                        | ESTIMATED ERROR:                                                                                                                                                                                                               |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5$ ;                                                                                                                                                          |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5$ ;<br>$\delta r = \pm 0.3$ ;                                                                                                                                |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} = \pm 0.3\%.$                                                                                                                         |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} = \pm 0.3\%.$<br>REFERENCES:                                                                                                          |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} = \pm 0.3\%.$<br>REFERENCES:<br>1. O'Sullivan, T. D. and Smith, N. O.,                                                                |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} = \pm 0.3\%.$<br>REFERENCES:<br>1. O'Sullivan, T. D. and Smith, N. O.,<br>Geochem. Cosmochim. Acta, <u>1966</u> ,                     |  |  |
|                                        | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} = \pm 0.3\%.$<br>REFERENCES:<br>1. O'Sullivan, T. D. and Smith, N. O.,<br><i>Geochem. Cosmochim. Acta</i> , <u>1966</u> ,<br>30, 617. |  |  |

| COMPONENTS :                                                                                                                                                 |                                              | ORIGINAL           | MEASUREMENTS                                                           | :                    |              |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------|------------------------------------------------------------------------|----------------------|--------------|--|
| (1) Helium: He: 7440-59-7                                                                                                                                    | Stephan, E. L., Hatfield, N. S.,             |                    |                                                                        |                      |              |  |
|                                                                                                                                                              | Peoples, R. S. and Pray, H. A. H.            |                    |                                                                        |                      |              |  |
| (2) Uranyi Sulfate; $00_2 S0_4$ ; 1314-64-3                                                                                                                  |                                              |                    | Battelle Memorial Institute Report                                     |                      |              |  |
| (3) Water; H <sub>2</sub> O; 7732-18-5                                                                                                                       | BMI-100                                      | 57, 1956.          |                                                                        |                      |              |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |
| VARIABLES:                                                                                                                                                   |                                              | PREPARED           | BY :                                                                   |                      |              |  |
|                                                                                                                                                              |                                              | 0 T 1              |                                                                        |                      |              |  |
| Temperature, pressure, compos                                                                                                                                | SITION                                       | С. П. :            | roung                                                                  |                      |              |  |
| EXPERIMENTAL VALUES:                                                                                                                                         |                                              |                    |                                                                        | ·····                |              |  |
| T/K g Uranium P <sup>+</sup> /bar So<br>per liter                                                                                                            | olubility <sup>*</sup>                       | т/к                | g Uranium<br>per liter                                                 | P <sup>+</sup> /bar  | * Solubility |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |
| 435.92 40 35.4                                                                                                                                               | 0.618                                        | 533.15             | 100                                                                    | 29.6<br>26.2         | 0.91         |  |
| 34.5                                                                                                                                                         | 0.610                                        |                    |                                                                        | 23.4                 | 0.78         |  |
|                                                                                                                                                              |                                              |                    | 243                                                                    | 35.2                 | 0.865        |  |
| 27.2                                                                                                                                                         | 0.375                                        |                    |                                                                        | 29.0                 | 0.725        |  |
| 243 33.4                                                                                                                                                     | 0.325                                        | 574.82             | 40                                                                     | 19.0                 | 1.12         |  |
| 31.0<br>29.3                                                                                                                                                 | 0.33                                         |                    |                                                                        | 18.3                 | 0.835        |  |
| 26.5                                                                                                                                                         | 0.26                                         |                    |                                                                        | 10.3                 | 0.62         |  |
| 533.15 40 27.6                                                                                                                                               | 1.13                                         |                    | 100                                                                    | 19.0                 | 0.975        |  |
| 24.8                                                                                                                                                         | 1.06                                         |                    |                                                                        | 17.2                 | 0.90         |  |
|                                                                                                                                                              |                                              |                    |                                                                        | 15.5                 | 0.81         |  |
| * ml of helium a                                                                                                                                             | t S.T.P. p                                   | er g of            | solution                                                               |                      |              |  |
|                                                                                                                                                              | AUXILIARY                                    | INFORMATI          | ION                                                                    |                      |              |  |
| METHOD /APPARATUS/PROCEDURE:                                                                                                                                 |                                              | SOURCE A           | ND PURITY OF                                                           | MATERIALS:           |              |  |
| Static equilibrium cell. G                                                                                                                                   | as and                                       |                    |                                                                        |                      |              |  |
| liquid equilibrated for 18 ho<br>Pressure measured with Bourdo<br>and temperature measured with<br>couple. Composition of liquestimated by volumetric method | ours.<br>on gauge<br>n thermo-<br>uid<br>od. |                    | No details                                                             | given.               |              |  |
| Details in source. Partial<br>estimated by subtracting vapo<br>pressure from total pressure                                                                  | pressure<br>or<br>•                          |                    |                                                                        |                      |              |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |
|                                                                                                                                                              |                                              | estimate<br>δt/k = | $\begin{array}{l} \text{D ERROR:} \\ \pm 0.6;  \delta P/1 \end{array}$ | $bar = \pm 0$        | .3;          |  |
|                                                                                                                                                              | δ(solubility) = ±3% (estimated by compiler). |                    |                                                                        | nated by<br>npiler). |              |  |
|                                                                                                                                                              |                                              | REFERENC           | EES:                                                                   |                      |              |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |
|                                                                                                                                                              |                                              |                    |                                                                        |                      |              |  |

| COMPONENTS:              | EVALUATOR:                                            |  |  |
|--------------------------|-------------------------------------------------------|--|--|
| 1. Helium; He; 7440-59-7 | Colin Young,<br>School of Chemistry,                  |  |  |
| 2. Methane; CH4; 74-82-8 | University of Melbourne,<br>Parkville, Victoria 3052, |  |  |
|                          | AUSTRALIA.                                            |  |  |

CRITICAL EVALUATION:

Measurements on this system have been reported in six publications. The measurements by Sinor *et al.* (1), Rhodes and coworkers (2), (3), Heck and Hiza (4) and Streett *et al.* (5) are in good agreement in the ranges of temperature and pressures where there is extensive overlap. The data of Streett *et al.* (5) are of lower accuracy than those of the other workers mentioned above but the range of pressure is more than an order of magnitude greater. All the above data are classified as tentative.

The data of Gonikberg and Fastowski appear to be somewhat high when compared with extrapolated and interpolated data obtained from the results of the five above studies and are therefore classified as doubtful.

#### References

- Sinor, J. E., Schindler, D. L. and Kurata, F., Am. Inst. Chem. Engnrs. J., 1966, 12, 353.
- Rhodes, H. L., De Vaney, W. E. and Tully, P. C., J. Chem. Engng. Data, <u>1971</u>, 16, 19.
- De Vaney, W. E., Rhodes, H. L. and Tully, P. C., J. Chem. Engng. Data, 1971, 16, 158.
- 4. Heck, C. K. and Hiza, M. J., Am. Inst. Chem. Engnrs. J., 1967, 13, 593.
- 5. Streett, W. B., Erickson, A. L. and Hill, J. L. E., *Physics Earth Planetary Interiors*, <u>1972</u>, 6, 69.
- Gonikberg, M. G. and Fastowski, V. G., Acta Physicochimica U.R.S.S., 1940, 13, 399.

| (1) Helium; He; 7440-59-7<br>(2) Methane; CH.; 74-82-8<br>VARIABLES:<br>Temperature, pressure<br>EXPERIMENTAL VALUES:<br>Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{2}$ Mole fraction of helium<br>T/K P/bar in liquid, and the set of th | COMPONEN                                                                                        | TS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                              | ORIGINAI                                                                                                                  | MEASUREM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ENTS:                                                                                                                                                                                                                                            | <u></u>                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VARIABLES:<br>Temperature, pressure       PREPARED BY:<br>C. L. Young         EXPRENSIMAL VALUES:<br>Mole fraction of helium<br>7/K       Mole fraction of helium<br>7/K         93.15       17.2       0.0006       0.984       153.15       55.2       0.0130       0.744         93.15       0.0226       -995       103.4       0.0320       0.6850         13.7       0.0016       0.994       86.18       0.0266       0.225         13.7       0.0034       -97       133.4       0.0320       0.6861         13.7       0.0034       0.995       133.4       0.0322       0.491         13.15       17.2       0.0034       0.957       137.9       0.012       0.713         13.4.5       0.0028       0.957       137.9       0.012       0.714         13.7.9       0.0070       0.984       68.18       0.0678       0.253         13.7.9       0.0024       0.696       103.4       0.0360       0.351         13.7.9       0.0166       0.921       189.15       137.9       0.130 <t< td=""><td>(1) He<br/>(2) Me</td><td>elium; H<br/>ethane;</td><td>He; 7440-59-<br/>CH4; 74-82-</td><td>7<br/>8</td><td>Sinor,<br/>Kurata<br/>1966,</td><td>J. E.,<br/>, F., Am<br/>12, 353.</td><td>Schindler, D.<br/>. Inst. Chem.</td><td>L. and<br/>Engnrs.J.</td></t<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | (1) He<br>(2) Me                                                                                | elium; H<br>ethane;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | He; 7440-59-<br>CH4; 74-82-                                                                                                                                                                                                                                                          | 7<br>8                                                                                                                                                                                                       | Sinor,<br>Kurata<br>1966,                                                                                                 | J. E.,<br>, F., Am<br>12, 353.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Schindler, D.<br>. Inst. Chem.                                                                                                                                                                                                                   | L. and<br>Engnrs.J.                                                                                                                                                                                                  |
| EXPERIMENTAL VALUES:<br>Mole fraction of helium<br>7/k P/bar in liquid, in vapor,<br>$\frac{\pi_{He}}{93.15}$ 17.2 0.0006 0.984 153.15 55.2 0.0163 0.744<br>93.15 17.2 0.0016 0.994 86.18 0.0266 0.825<br>1.13.4 0.0026 - 120.7 0.0366 0.867<br>1.13.4 0.0032 0.995 103.4 0.0320 0.850<br>86.18 0.0026 - 120.7 0.0366 0.867<br>1.13.15 17.2 0.0013 0.914 66.95 0.0322 0.491<br>1.13.15 17.2 0.0013 0.914 66.95 0.0322 0.491<br>1.13.15 17.2 0.0013 0.914 66.95 0.0322 0.491<br>1.13.15 17.2 0.0024 0.597 103.4 0.0324 0.6324<br>51.7 0.0024 0.596 103.4 0.0324 0.6324<br>51.7 0.0024 0.596 103.4 0.0324 0.632<br>1.13.15 17.2 0.0024 0.596 103.4 0.0361 0.6324<br>51.17 0.0026 0.596 103.4 0.0361 0.6324<br>51.17 0.0026 0.590 1.13.9 0.142 0.733<br>1.20.7 0.1006 - 137.9 0.130 0.415<br>66.95 0.0014 0.912 189.15 137.9 0.142 0.056<br>1.13.9 0.120 0.044 0.695 10.0428 0.322<br>1.13.15 17.2 0.0024 0.525 120.7 0.1105 0.322<br>1.13.15 17.2 0.0024 0.591 120.7 0.1105 0.322<br>1.13.15 17.9 0.120 0.041 - 189.65 137.9 0.152 0.348<br>103.4 0.0169 0.938 190.15 137.9 0.152 0.348<br>103.4 0.0169 0.938 190.15 137.9 0.166 0.320<br>1.137.9 0.2214 0.952 190.65 037.9 0.166 0.320<br>1.137.9 0.0214 0.551 190.95 137.9 0.265 0.275<br>41.4 0.0109 0.667<br>AUXILIARY INFORMATION<br>METHOD /APPARATUS/PROCEDURE:<br>Static equilibrium cell (0.1 & capa-<br>city) fitted with magnetic stirrer.<br>Temperature measured with platinum<br>resistance thermometer. Presure<br>measured with Blourdon gauge. Contents<br>charged into cell, equilibrated;<br>vapor and liquid samples withdrawn and<br>analysed by G.C. Details in source.<br>ESTIMATED ERROR:<br>$\delta \gamma_{\rm He} = \pm 1.8$ .<br>REFERENCES:<br>ESTIMATED ERROR:<br>$\delta \gamma_{\rm He} = \pm 1.8$ .<br>REFERENCES:                                                                                                                                                                                                               | VARIABLE<br>Tempera                                                                             | S:<br>iture, pi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ressure                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                              | PREPAREI<br>C. L.                                                                                                         | ) BY:<br>Young                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                      |
| 93.1517.20.00060.984153.1555.20.01630.74434.50.00110.99268.950.0205-68.950.0220.995103.40.03200.85068.950.0220.995103.40.03200.867103.40.00320.997137.90.04040.884120.70.0034-173.1534.50.00600.150137.90.00390.99851.70.01890.361137.90.00260.95786.180.04170.55466.180.0670.980137.90.07120.713103.40.00780.982188.1551.70.01420.05366.180.06670.980137.90.07120.713103.40.00780.982188.1551.70.01420.058133.1517.20.00340.696103.40.09060.322133.1517.20.00340.98186.180.06760.232133.1517.20.00340.98586.180.06760.232133.1517.20.00340.981137.90.13000.415133.1517.20.00360.837120.70.10000.322133.1517.20.00360.938191.15137.90.1380.322133.1517.20.00360.938191.15137.90.1380.322133.1517.60.016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | EXPERIME<br>T/K                                                                                 | NTAL VALU<br>N<br>P/bar i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ES:<br>Aole fractic<br>in liquid,<br><sup>\$\vec{\vec{v}_{He}}\)</sup>                                                                                                                                                                                                               | n of helium<br>in vapor,<br><sup>y</sup> ue                                                                                                                                                                  | т/к                                                                                                                       | P/bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mole fraction<br>in liquid,<br><sup>x</sup> ue                                                                                                                                                                                                   | of helium<br>in vapor,<br><sup>y</sup> He                                                                                                                                                                            |
| AUXILIARY INFORMATION<br>METHOD /APPARATUS/PROCEDURE:<br>Static equilibrium cell (0.1 ½ capa-<br>city) fitted with magnetic stirrer.<br>Temperature measured with platinum<br>resistance thermometer. Pressure<br>measured with Bourdon gauge. Contents<br>charged into cell, equilibrated;<br>vapor and liquid samples withdrawn and<br>analysed by G.C. Details in source.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \ \delta P/bar = \pm 0.1; \ \delta x_{He} = \pm 1 \$ \text{ or } 0.0003 (whichever is greater)} $<br>$\delta y_{He} = \pm 1 \$.$<br>REFERENCES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 93.15<br>113.15<br>133.15<br>153.15                                                             | 17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>17.2<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>27.6<br>41.4 | 0.0006<br>0.0011<br>0.0016<br>0.0022<br>0.0026<br>0.0032<br>0.0034<br>0.0039<br>0.0013<br>0.0028<br>0.0042<br>0.0042<br>0.0055<br>0.0067<br>0.0078<br>0.0090<br>0.0099<br>0.0024<br>0.0056<br>0.0056<br>0.0086<br>0.0116<br>0.0144<br>0.0169<br>0.0193<br>0.0214<br>0.0058<br>0.0199 | 0.984<br>0.992<br>0.994<br>0.995<br>0.997<br>0.997<br>0.998<br>0.914<br>0.957<br>0.969<br>0.976<br>0.980<br>0.982<br>0.984<br>0.985<br>0.696<br>0.837<br>0.912<br>0.938<br>0.912<br>0.938<br>0.9519<br>0.667 | 153.15<br>173.15<br>188.15<br>189.15<br>189.65<br>190.15<br>190.45<br>190.65<br>190.95                                    | 55.2<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>34.5<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>51.7<br>68.95<br>86.18<br>103.4<br>120.7<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>137.9<br>37.9<br>137.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9<br>37.9 | 0.0163<br>0.0205<br>0.0266<br>0.0320<br>0.0366<br>0.0404<br>0.0060<br>0.0189<br>0.0322<br>0.0417<br>0.0524<br>0.0618<br>0.0712<br>0.0142<br>0.0428<br>0.0678<br>0.0906<br>0.1105<br>0.1300<br>0.138<br>0.152<br>0.166<br>0.178<br>0.183<br>0.265 | 0.744<br>0.825<br>0.850<br>0.867<br>0.884<br>0.150<br>0.361<br>0.491<br>0.554<br>0.632<br>0.674<br>0.713<br>0.058<br>0.169<br>0.253<br>0.322<br>0.372<br>0.372<br>0.372<br>0.348<br>0.320<br>0.300<br>0.287<br>0.275 |
| <pre>METHOD /APPARATUS/PROCEDURE:<br/>Static equilibrium cell (0.1 &amp; capa-<br/>city) fitted with magnetic stirrer.<br/>Temperature measured with platinum<br/>resistance thermometer. Pressure<br/>measured with Bourdon gauge. Contents<br/>charged into cell, equilibrated;<br/>vapor and liquid samples withdrawn and<br/>analysed by G.C. Details in source.</pre> SOURCE AND PURITY OF MATERIALS:<br>1. Bureau of Mines sample maximum<br>impurity 12 parts per million.<br>2. Phillips Petroleum pure grade<br>purity < 99 mole per cent.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \ \delta P/bar = \pm 0.1; \ \delta x_{He} = \pm 1 $ % or 0.0003 (whichever is greater)<br>$\delta y_{He} = \pm 1 $ %.<br>REFERENCES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 | <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                      | AUXILIARY                                                                                                                                                                                                    | INFORMAT                                                                                                                  | ION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  | · · · · ·                                                                                                                                                                                                            |
| · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | METHOD /<br>Static<br>city) f<br>Tempera<br>resista<br>measure<br>charged<br>vapor a<br>analyse | APPARATU<br>equilibr<br>itted wi<br>ture mean<br>nce ther<br>d with B<br>into ce<br>nd liqui<br>d by G.C                                                                                                                                                                                                                                                                                                                                                                                                        | S/PROCEDURE<br>ium cell (0<br>th magnetic<br>sured with<br>mometer.<br>ourdon gaug<br>11, equilib<br>d samples w<br>. Details                                                                                                                                                        | :<br>.1 1 capa-<br>stirrer.<br>platinum<br>Pressure<br>e. Content<br>rated;<br>ithdrawn and<br>in source.                                                                                                    | SOURCE A<br>1. But<br>imj<br>2. Ph:<br>put<br>s<br>ESTIMATI<br>$\delta T/K =$<br>±1% or<br>$\delta y_{He} =$<br>REFERENCE | ND PURITY<br>reau of purity 1<br>illips P<br>city < 9<br>city < 9<br>city < 9<br>color:<br>±0.02;<br>0.0003<br>±1%.<br>CES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | OF MATERIALS:<br>Mines sample π<br>2 parts per m<br>etroleum pure<br>9 mole per cen<br>δP/bar = ±0.1<br>(whichever is                                                                                                                            | maximum<br>illion.<br>grade<br>nt.<br>l; δ <i>x</i> <sub>He</sub> =<br>greater)                                                                                                                                      |

COMPONENTS:

| COMPONENTS:                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                               |                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                    |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| (1) Helium; He; 7440-59-7<br>(2) Methane; CH4; 74-82-8                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                | Rhodes, H. L., DeVaney, W. E. and<br>Tully, P. C., J. Chem. Engng. Data,<br><u>1971</u> , 16, 19.                                                                                                                                                    |                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                    |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                | P REPARED                                                                                                                                                                                                                                            | BY:                                                                                                                                                                                                                           |                                                                                                                                          |                                                                                                                                                    |  |  |
| Temperature, pressure                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                | C. L. Young                                                                                                                                                                                                                                          |                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                    |  |  |
| EXPERIME                                                                                                                                                                                                                                                                                                                                                  | NTAL VALU                                                                                                                                                                                                                     | ES:                                                                                                                            |                                                                                                                                |                                                                                                                                                                                                                                                      | <u>_</u>                                                                                                                                                                                                                      |                                                                                                                                          |                                                                                                                                                    |  |  |
| т/к                                                                                                                                                                                                                                                                                                                                                       | P/bar                                                                                                                                                                                                                         | Mole fraction<br>in liquid,<br><sup>x</sup> He                                                                                 | of helium<br>in gas,<br><sup>y</sup> He                                                                                        | т/к                                                                                                                                                                                                                                                  | P/bar                                                                                                                                                                                                                         | Mole fraction<br>in liquid,<br><sup>x</sup> He                                                                                           | of helium<br>in gas,<br><sup>y</sup> He                                                                                                            |  |  |
| 94.00<br>124.00<br>154.00                                                                                                                                                                                                                                                                                                                                 | 69.57<br>69.84<br>103.4<br>103.5<br>139.5<br>139.1<br>69.29<br>69.02<br>103.3<br>103.3<br>137.7<br>137.6<br>206.4<br>207.0<br>261.7<br>261.5<br>69.09<br>68.88<br>103.4<br>138.3<br>137.9<br>206.8<br>206.6<br>261.7<br>261.9 | 0.0022<br>0.0028<br>0.0036<br>0.0079<br>0.0112<br>0.0135<br>0.0196<br>0.0232<br>0.0192<br>0.0290<br>0.0376<br>0.0520<br>0.0618 | 0.9962<br>0.9968<br>0.9978<br>0.9544<br>0.9675<br>0.9744<br>0.9816<br>0.9849<br>0.7618<br>0.8314<br>0.8685<br>0.9048<br>0.9048 | 164.00                                                                                                                                                                                                                                               | 68.88<br>86.39<br>86.25<br>103.4<br>103.5<br>137.6<br>137.9<br>172.8<br>172.7<br>207.1<br>207.0<br>261.7<br>262.1<br>68.88<br>68.74<br>86.05<br>85.98<br>103.5<br>103.1<br>137.7<br>137.6<br>172.3<br>172.1<br>206.8<br>260.2 | 0.0238<br>0.0310<br>0.0378<br>0.0498<br>0.0609<br>0.0702<br>0.0836<br>0.0291<br>0.0396<br>0.0493<br>0.0669<br>0.0820<br>0.0820<br>0.0957 | 0.6300<br>0.6924<br>0.7341<br>0.7900<br>0.8253<br>0.8499<br>0.8761<br>0.4580<br>0.5386<br>0.5986<br>0.5986<br>0.6768<br>0.7280<br>0.7642<br>0.8035 |  |  |
|                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                               |                                                                                                                                | AUXILIARY                                                                                                                      | INFORMATI                                                                                                                                                                                                                                            | INFORMATION                                                                                                                                                                                                                   |                                                                                                                                          |                                                                                                                                                    |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>Recirculating vapor flow apparatus.<br>Beryllium-copper windowed cell. Vapor<br>recirculated through external loop.<br>Temperature measured with platinum<br>resistance thermometer and measured by<br>pressure transducer and Bourdón gauge<br>calibrated against a dead weight tester.<br>Details in source and ref. 1. |                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Ultrapure sample purity better than 99.99 mole per cent.</li> <li>2. Sample contained oxygen and nitrogen impurities purity 99.99 mole per cent.</li> </ul>                                     |                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                    |  |  |
|                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.01;  \delta P/bar = \pm 0.15;$<br>$\delta x_{He} \simeq \delta y_{He} = \pm 0.0005.$<br>REFERENCES:<br>1. Tully, P. C., DeVaney, W. E. and<br>Rhodes, H. L., Adv. Cryogenic<br>Engng., <u>1971</u> , 16, 88. |                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                    |  |  |

| COMPONENTS: |                |                          |                         | ORIGINAL MEASUREMENTS:                                                   |                 |                        |                         |
|-------------|----------------|--------------------------|-------------------------|--------------------------------------------------------------------------|-----------------|------------------------|-------------------------|
| (1)         | Helium;        | He; 7440-59-             | 7                       | Rhodes, H. L., DeVaney, W. E. and<br>Tully, P. C., J. Chem. Engng. Data, |                 |                        |                         |
| (2)         | Methane;       | CH <sub>4</sub> ; 74-82- | B                       | <u>1971</u> , 1                                                          | 16, 19.         |                        |                         |
|             |                |                          |                         |                                                                          |                 |                        |                         |
| EXPERI      | MENTAL V       | ALUES:                   |                         |                                                                          |                 |                        |                         |
|             |                | Mole fraction            | of helium               |                                                                          |                 | Mole fraction          | of helium               |
| т/к         | <i>P/</i> bar  | in liquid,<br>x          | in gas,<br><sup>v</sup> | т/к                                                                      | <i>P/</i> bar   | in liquid,<br><i>x</i> | in gas,<br><sup>v</sup> |
|             |                | "Не                      | <sup>9</sup> He         |                                                                          |                 | He                     | ° He                    |
| 174.00      | 259.8          | 0.1126                   | -                       | 190.60                                                                   | 172.1           | 0.1899                 | -                       |
| 184.00      | 68.88          | -                        | 0.2518                  |                                                                          | 206.8           | -                      | 0.4503                  |
|             | 68.85<br>86 18 | 0.0353                   | -                       |                                                                          | 207.1<br>262 ii | 0.2129                 | -<br>0 5351             |
|             | 86.25          | 0.0525                   | -                       |                                                                          | 261.9           | 0.2395                 | -                       |
|             | 103.4          | -                        | 0.4081                  | 190.90                                                                   | 114.2           | 0.1562                 | 0.2043                  |
|             | 103.1          | 0.0681                   | -                       |                                                                          | 118.8           | -                      | 0.2210                  |
| ļ           | 120.3          | -<br>0 0920              | 0.4617                  |                                                                          | 118.3           | 0.1585                 | -                       |
|             | 138 4          | 0.0820                   | -<br>0 5082             |                                                                          | 123.8           | 0 1620                 | 0.2358                  |
|             | 138.3          | 0.0957                   | -                       |                                                                          | 138.0           | -                      | 0.2787                  |
|             | 172.9          | -                        | 0.5769                  |                                                                          | 137.9           | 0.1743                 | -                       |
|             | 172.6          | 0.1187                   | -                       |                                                                          | 172.3           | -                      | 0.3645                  |
|             | 206.6          | -<br>0 1276              | 0.6271                  |                                                                          | 172.2           | 0.2012                 | -                       |
|             | 262.1          | 0.1376                   | 0.6877                  |                                                                          | 207.0           | 0.2224                 | 0.4301<br>-             |
|             | 262.0          | 0.1621                   | -                       |                                                                          | 261.9           | 0.2472                 | 0.5228                  |
| 189.00      | 68.88          | -                        | 0.1399                  | 191.06                                                                   | 137.8           | -                      | 0.2530                  |
|             | 68.95          | 0.0429                   | -                       | 101 10                                                                   | 137.4           | 0.1936                 | -                       |
|             | 85.98          | 0 0680                   | 0.2138                  | 191.10                                                                   | 207.1           | -                      | 0.4230                  |
|             | 103.4          | 0.0000                   | 0.2769                  | 191.37                                                                   | 172.5           | 0.2300                 | 0.3054                  |
|             | 103.6          | 0.0909                   | -                       |                                                                          | 172.4           | 0.2478                 | -                       |
|             | 120.8          | -                        | 0.3306                  | 191.40                                                                   | 176.1           | -                      | 0.3113                  |
|             | 120.4          | 0.1112                   | -                       |                                                                          | 176.0           | 0.2526                 | -                       |
|             | 172.4          | 0.1284                   | 0.4514                  |                                                                          | 179.0           | 0.2445                 | 0.3263                  |
|             | 172.5          | 0.1585                   | -                       |                                                                          | 192.7           | -                      | 0.3650                  |
| 190.30      | 68.95          | -                        | 0.1019                  |                                                                          | 193.0           | 0.2439                 | -                       |
|             | 68.81          | 0.0511                   | -                       |                                                                          | 206.9           | -                      | 0.3991                  |
|             | 86.18          | 0 0810                   | 0.16/3                  |                                                                          | 206.2           | 0.2456                 | -                       |
|             | 103.4          | -                        | 0.2236                  |                                                                          | 262.1           | 0.2632                 | 0.4987                  |
|             | 103.5          | 0.1086                   | -                       | 191.68                                                                   | 207.0           | -                      | 0.3589                  |
|             | 120.6          | -                        | 0.2753                  |                                                                          | 206.7           | 0.2804                 | -                       |
|             | 120.5          | 0.1316                   | -                       | 192.00                                                                   | 236.4           | -                      | 0.3849                  |
|             | 138.0<br>137.7 | 0 1508                   | 0.3211                  |                                                                          | 236.L           | 0.3058                 | - 2011                  |
|             | 172.6          | -                        | 0.4000                  |                                                                          | 237.9           | 0.3080                 | -                       |
|             | 172.3          | 0.1806                   | -                       |                                                                          | 248.3           | -                      | 0.4227                  |
|             | 206.8          | -                        | 0.4651                  |                                                                          | 248.1           | 0.2998                 | -                       |
|             | 206.6          | 0.2054                   | -                       |                                                                          | 262.0           | 0.2946                 | 0.4557                  |
| 190.60      | 262.1          | 0.2327                   | 0.5464                  |                                                                          | 262.1           | 0.2944                 | 0 4548                  |
| 100.00      | 103.4          | 0.1182                   | 0.2043                  | 192.20                                                                   | 262.1           | _                      | 0.4288                  |
|             | 137.9          | -                        | 0.3029                  |                                                                          | 262.0           | 0.3153                 | -                       |
|             | 137.8          | 0.1594                   | -                       | 192.29                                                                   | 262.0           | 0.3417                 | 0.4071                  |
|             | 172.6          | -                        | 0.3850                  |                                                                          |                 |                        |                         |
|             |                |                          | <del> <u> </u></del>    | · · · · · · · · · · · · · · · · · · ·                                    |                 |                        |                         |
|             |                |                          |                         |                                                                          |                 |                        |                         |
|             |                |                          |                         |                                                                          |                 |                        |                         |

| COMPONENT                 | 'S:                                   |                       |                                      | ORTGINAL                                       | MEASUREME               | INTS :          |             |  |
|---------------------------|---------------------------------------|-----------------------|--------------------------------------|------------------------------------------------|-------------------------|-----------------|-------------|--|
|                           |                                       |                       |                                      | OKIGINAL                                       | HERSOREH                | 2013 •          |             |  |
| (1) Helium; He; 7440-59-7 |                                       |                       | Streett, W. B., Erickson, A. L., and |                                                |                         |                 |             |  |
| (2) Me                    | (2) Mothano, $C^{\mu}$ , $74_{-}^{0}$ |                       |                                      | Hill, J                                        | . L. E.,                | , Physics Earth | 1           |  |
| (2) 110                   | cinane,                               | Cir4, 74-02-0         |                                      | Planeta                                        | ry Inter                | riors, 1972, 6  | , 69.       |  |
| 1                         |                                       |                       |                                      |                                                |                         |                 |             |  |
|                           |                                       |                       |                                      |                                                |                         |                 |             |  |
| VARIABLES                 | 5 <b>:</b>                            |                       |                                      | PREPARED BY:                                   |                         |                 |             |  |
| Tempera                   | ture, p                               | pressure              |                                      | С. Г. Х                                        | oung                    |                 |             |  |
|                           |                                       |                       |                                      |                                                |                         |                 |             |  |
| EXPERIMEN                 | TAL VAL                               | UES:<br>Molo fraction | of holium                            |                                                |                         | Mole fraction   | of holium   |  |
| T/K                       | P/bar                                 | in liquid,            | in vapor,                            | T/K                                            | P/bar                   | in liquid,      | in vapor,   |  |
|                           |                                       | $x_{\text{He}}$       | ${}^{y}$ He                          |                                                |                         | <sup>x</sup> He | ${}^{y}$ He |  |
| 94.92                     | 62                                    | 0.0023                | 0.9931                               | 130.16                                         | 482                     | 0.0398          | 0.9858      |  |
|                           | 152                                   | 0.0038                | 0.9966                               |                                                | 643                     | 0.0451          | 0.9882      |  |
|                           | $\frac{172}{204^{a}}$                 | 0.0050                | 0.9973                               |                                                | 850<br>973              | 0.0488          | 0.9903      |  |
| 100.05                    | 164                                   | 0.0056                | 0.9946                               |                                                | 1102                    | 0.0510          | 0.9935      |  |
|                           | 207                                   | 0.0069                | 0.9954                               |                                                | 1232                    | 0.0508          | 0.9935      |  |
|                           | 241                                   | 0.0077                | 0.9954                               |                                                | 1378                    | 0.0519          | 0.9940      |  |
|                           | 352                                   | 0.0098                | 0.9957                               |                                                | 1791                    | 0.0517          | 0.9956      |  |
| ļ                         | 413                                   | 0.0111                | 0.9963                               |                                                | 2188 <sup>a</sup>       | 0.052           | 0.996       |  |
| 105 00                    | 458                                   | 0.012                 | 0.997                                | 139.85                                         | 482                     | 0.0559          | 0.9763      |  |
| 105.09                    | 283                                   | 0.0125                | 0.9946                               |                                                | 628<br>819              | 0.0618          | 0.9800      |  |
|                           | 413                                   | 0.0140                | 0.9973                               |                                                | 965                     | 0.0691          | 0.9865      |  |
|                           | 482                                   | 0.0144                | 0.9977                               |                                                | 1102                    | 0.0707          | 0.9876      |  |
|                           | 551                                   | 0.0155                | 0.9979                               |                                                | 1378                    | 0.0709          | 0.9906      |  |
|                           | 620<br>669 <sup>a</sup>               | 0.0163                | 0.9983                               |                                                | 2205                    | 0.0693          | 0.9938      |  |
| 110.07                    | 276                                   | 0.0136                | 0.9948                               |                                                | 2480                    | 0.0660          | 0.9980      |  |
|                           | 413                                   | 0.0170                | 0.9955                               |                                                | 2619                    | 0.0642          | 0.9959      |  |
|                           | 489                                   | 0.0186                | 0.9970                               |                                                | 2810 <sup>°°</sup>      | 0.062           | 0.998       |  |
|                           | 620<br>765                            | 0.0209                | 0.9977                               | 149.78                                         | 227                     | 0.0500          | 0.9286      |  |
|                           | 827                                   | 0.0228                | 0.9981                               |                                                | 689                     | 0.0867          | 0.9674      |  |
|                           | 954 <sup>a</sup>                      | 0.024                 | 0.998                                |                                                | 965                     | 0.0939          | 0.9783      |  |
| 130.16                    | 353                                   | 0.0334                | 0.9820                               |                                                | 1378                    | 0.0955          | 0.9844      |  |
|                           |                                       |                       | AUXILIARY                            | INFORMATI                                      | ON                      |                 |             |  |
| METHOD 72                 | APPARAT                               | US/PROCEDURE:         |                                      | SOURCE AN                                      | ND PURITY               | OF MATERIALS:   |             |  |
| Recircu                   | lating                                | vapor flow appa       | aratus                               | No                                             | o detail                | ls given.       |             |  |
| with mag                  | gnetic                                | pump. Tempera         | ture                                 |                                                |                         |                 |             |  |
| thermome                  | a with                                | Platinum resist       | ance<br>with                         |                                                |                         |                 |             |  |
| Manganin                  | n resis                               | tance gauge.          | Samples                              |                                                |                         |                 |             |  |
| of liqu:                  | id and                                | gas analysed by       | thermal                              |                                                |                         |                 |             |  |
| conduct                   | ivity.                                | Details in re         | ef. 1.                               |                                                |                         |                 |             |  |
|                           |                                       |                       |                                      |                                                |                         |                 |             |  |
|                           |                                       |                       |                                      |                                                |                         |                 |             |  |
|                           |                                       |                       |                                      |                                                |                         |                 |             |  |
|                           |                                       |                       |                                      | <u> </u>                                       |                         |                 |             |  |
|                           |                                       |                       |                                      | ESTIMATE                                       | D ERROR:                |                 |             |  |
| ļ                         |                                       |                       |                                      | $\delta T/K = \pm 0.02; \delta P/bar = \pm 5;$ |                         |                 |             |  |
|                           |                                       |                       |                                      | δ <sup>x</sup> He' <sup>δ</sup>                | $y_{\text{He}} = \pm 1$ | l mole per cent | -           |  |
|                           |                                       |                       |                                      | REFERENC                                       | FS.                     |                 |             |  |
|                           |                                       |                       |                                      | 17                                             | D and Endals-           | ~ ~ ~           |             |  |
|                           |                                       |                       | L. Scree                             | -LL, W.                                        | D. and Erickso          | ли, А. Ц.,      |             |  |
| l                         |                                       |                       |                                      | Physi                                          | ics Eart                | tn Planetary Ir | iteriors,   |  |
|                           |                                       |                       |                                      | 1972                                           | , 5, 35                 | 7.              |             |  |
|                           |                                       |                       |                                      |                                                |                         |                 |             |  |
| 1                         |                                       |                       |                                      | 1                                              |                         |                 |             |  |
|                           |                                       |                       |                                      | ,                                              |                         |                 |             |  |

| COMPONENTS:               |                          |                          |                  | ORIGINAL MEASUPTMENTS:               |                          |                                    |                 |
|---------------------------|--------------------------|--------------------------|------------------|--------------------------------------|--------------------------|------------------------------------|-----------------|
| (1) Helium; He; 7440-59-7 |                          |                          |                  | Streett, W. B., Erickson, A. L., and |                          |                                    |                 |
| (2)                       | 2) Methane; CH4; 74-82-8 |                          |                  | Hill,<br>Planet                      | J. L. E<br>ary Int       | ., Physics Eart<br>eriors, 1972, 6 | th<br>5,69.     |
|                           |                          |                          |                  |                                      | -                        |                                    |                 |
| <br>                      |                          |                          |                  | L                                    |                          |                                    |                 |
| EXPERI                    | MENTAL                   | VALUES:<br>Mole fraction | of helium        |                                      |                          | Nole fraction                      | of holdur       |
| т/к                       | P/bar                    | in liquid,               | in vapor,        | Т/К                                  | P <b>/</b> bar           | in liquid,                         | in vapor,       |
| <u></u>                   |                          | <sup>x</sup> He          | <sup>y</sup> He  |                                      |                          | <sup>x</sup> He                    | <sup>y</sup> He |
| 149.78                    | 3 1723<br>2067           | 0.0935<br>0.0897         | 0.9855<br>0.9903 | 187.81                               | 353<br>482               | 0.2276                             | 0.6906          |
|                           | 3102<br>3488a            | 0.0831                   | 0.9931           |                                      | 689                      | 0.2675                             | 0.8413          |
| 159.84                    | 276                      | 0.0763                   | 0.8610           |                                      | 965<br>1240              | 0.2677                             | 0.8861          |
|                           | 413                      | 0.0953                   | 0.9279           |                                      | 1654                     | 0.2481                             | 0.9412          |
| 1                         | 551<br>697               | 0.1076                   | -<br>0.9518      | 187.87                               | 165<br>198               | 0.1407                             | 0.4932          |
|                           | 827                      | 0.1200                   | 0.9589           |                                      | 267                      | 0.2077                             | 0.5989          |
| 1                         | 1034                     | 0.1245                   | 0.9670           | 189.97                               | 689                      | 0.2851                             | 0.8216          |
|                           | 1516                     | 0.1258                   | 0.9756           |                                      | 1385                     | 0.2803                             | 0.8877          |
|                           | 1791                     | 0.1225                   | 0.9796           |                                      | 1654                     | 0.2588                             | 0.9348          |
|                           | 2067                     | 0.1192                   | 0.9855           |                                      | 1929                     | 0.2491                             | 0.9478          |
|                           | 2480                     | 0.1145                   | 0.9899           |                                      | 2094 2411                | 0.2365                             | 0.9548          |
|                           | 2757                     | 0.1111                   | 0.9903           |                                      | 3102                     | 0.2123                             | 0.9810          |
|                           | 3102                     | 0.1066                   | 0.9924           |                                      | 3791<br>4135             | 0.1967                             | 0.9903          |
|                           | 3791                     | 0.0979                   | 0.9928           | 190.98                               | 138                      | 0.2177                             | 0.2862          |
|                           | 3881                     | 0.1018                   | 0.9817           |                                      | 145                      | 0.1705                             | 0.3195          |
|                           | 4088                     | 0.0981                   | 0.9899           |                                      | 168                      | 0.1915                             | 0.3579          |
|                           | 4163                     | 0.0985                   | 0.9913           |                                      | 241                      | 0.2365                             | 0.4927          |
|                           | 4212                     | 0.098                    | 0.9927           |                                      | 276                      | 0.2505                             | 0.5411          |
|                           | 4308 <sup>a</sup>        | 0.098                    | 0.994            |                                      | 719                      | 0.2055                             | 0.8176          |
| 180.08                    | 35                       | 0.0051                   | 0.1123           |                                      | 965                      | 0.2932                             | 0.8698          |
|                           | 46<br>60                 | 0.0071                   | 0.1589           | 192 58                               | 1240<br>248 <sup>b</sup> | 0.2836                             | 0.9038          |
|                           | 69                       | 0.0350                   | 0.3715           | 172.50                               | 276                      | 0.3267                             | 0.4563          |
|                           | 103                      | 0.0691                   | 0.4961           |                                      | 310                      | -                                  | 0.5463          |
|                           | 179                      | 0.1038                   | 0.6588           |                                      | 340<br>413               | 0.31/5<br>0.3147                   | 0.5645          |
|                           | 234                      | 0.1329                   | 0.7293           |                                      | 482                      | 0.3198                             | 0.6855          |
|                           | 293<br>482               | 0.1499                   | 0.7691           |                                      | 555                      | 0.3204                             | 0.7300          |
|                           | 628                      | 0.2011                   | 0.8797           |                                      | 689                      | 0.3198                             | 0.7720          |
|                           | 827                      | 0.2119                   | 0.9067           |                                      | 827                      | 0.3167                             | 0.8121          |
|                           | 1034                     | 0.2132<br>0.2107         | 0.9263           | 194.52                               | 1026<br>400 <sup>b</sup> | 0.3062                             | 0.8670          |
|                           | 1723                     | 0.2028                   | 0.9586           | 191102                               | 434                      | 0.3910                             | 0.5490          |
|                           | 2067                     | 0.1942                   | 0.9674           |                                      | 455                      | 0.3807                             | 0.5850          |
|                           | 2757                     | 0.1778                   | 0.9790           |                                      | 486                      | 0.3765                             | 0.6954          |
|                           | 3102                     | 0.1701                   | 0.9817           |                                      | 709                      | 0.3451                             | 0.7707          |
|                           | 3460<br>3633             | 0.1633                   | 0.980            |                                      | 896<br>1034              | 0.3280                             | 0.8296          |
|                           | 4135                     | 0.1516                   | 0.9889           | 198.33                               | 648 <sup>b</sup>         | 0.535                              | 0.535           |
|                           | 4156                     | 0.1516                   | 0.9859           |                                      | 689                      | 0.4610                             | 0.6380          |
|                           | 4839                     | 0.1459                   | 0.9876           |                                      | 728                      | 0.4439<br>0.4270                   | 0.6792          |
|                           | 5335                     | 0.1335                   | 0.9894           |                                      | 792                      | 0.4165                             | 0.7282          |
|                           | 5777<br>5845             | 0.1286                   | 0.9905           |                                      | 847                      | 0.4034                             | 0.7587          |
|                           | 5893                     | 0.1279                   | 0.9923           |                                      | 1461                     | 0.3002                             | 0.8921          |
|                           | 5976                     | 0.1265                   | 0.9930           |                                      | 1723                     | 0.3157                             | 0.9158          |
|                           | 6134                     | 0.1260                   | 0.9933           |                                      | 2067                     | 0.2956                             | 0.9358          |
|                           | 6167 <sup>a</sup>        | 0.125                    | 0.993            |                                      | 2757                     | 0.2632                             | 0.9596          |
|                           |                          |                          |                  |                                      |                          |                                    |                 |

| COMPONENTS:               |                                        |                         |                  | ORIGINAL MEASUREMENTS:               |                           |                       |                 |
|---------------------------|----------------------------------------|-------------------------|------------------|--------------------------------------|---------------------------|-----------------------|-----------------|
| (1) Helium; He; 7440-59-7 |                                        |                         |                  | Streett, W. B., Erickson, A. L., and |                           |                       |                 |
| (2)                       | (2) Methane; CH <sub>4</sub> ; 74-82-8 |                         |                  |                                      | J. L. E<br>ary Int        | eriors, <u>1972</u> , | th<br>6, 69.    |
|                           |                                        |                         |                  |                                      |                           |                       |                 |
|                           |                                        |                         |                  |                                      |                           |                       |                 |
| EXPER:                    | IMENTAL V                              | ALUES:<br>Mole fraction | of helium        |                                      |                           | Mole fraction         | of helium       |
| Т/К                       | P/bar                                  | in liquid,              | in vapor,        | T/K                                  | P/bar                     | in liquid,            | in vapor,       |
|                           |                                        | "He                     | <sup>9</sup> He  |                                      | Leap                      | "Не                   | <sup>y</sup> He |
| 198.3                     | 3 3102<br>3446                         | 0.2501<br>0.2413        | 0.9647<br>0.9708 | 215.07                               | 1689~<br>1723             | 0.662<br>0.5743       | 0.662<br>0.7460 |
| ł                         | 3791<br>3805                           | 0.2314                  | 0.9767           |                                      | 1757<br>1791              | 0.5457                | 0.7723          |
|                           | 3846                                   | 0.2243                  | 0.9671           |                                      | 1929                      | 0.4857                | 0.8317          |
|                           | 4135<br>4281                           | 0.2280                  | 0.9796           |                                      | 2067                      | 0.4571                | 0.8557          |
|                           | 4694                                   | 0.2012                  | 0.980            |                                      | 2757                      | 0.3737                | 0.9161          |
|                           | 5115<br>5659                           | 0.1886                  | 0.9826           |                                      | 3102                      | 0.3534                | 0.9316          |
|                           | 6134                                   | 0.1682                  | 0.9867           |                                      | 3791                      | 0.3127                | 0.9422          |
|                           | 6624                                   | 0.1622                  | 0.9884           | 221 10                               | 4135<br>2001b             | 0.2942                | 0.9565          |
|                           | 7596                                   | 0.1518                  | 0.9903           | 221.10                               | 2081                      | 0.6136                | 0.7431          |
|                           | 7948<br>7006a                          | 0.1446                  | 0.9903           |                                      | 2136                      | 0.5980                | 0.7618          |
| 203.75                    | 5 1006 <sup>b</sup>                    | 0.144                   | 0.589            |                                      | 2205                      | 0.5/1/                | 0.7825          |
|                           | 1019                                   | 0.5316                  | -                |                                      | 2274                      | 0.5259                | 0.8207          |
|                           | 1048                                   | 0.4950                  | 0.7256           |                                      | 2412 2757                 | 0.4806                | 0.8532          |
|                           | 1171                                   | 0.4479                  | 0.7508           |                                      | 3102                      | 0.3977                | 0.9158          |
|                           | 1447                                   | 0.3942                  | 0.8352           |                                      | 3446<br>3791              | 0.3681                | 0.9315          |
|                           | 1723                                   | 0.3639                  | 0.8813           |                                      | 4135 <sub>b</sub>         | 0.3258                | 0.9493          |
|                           | 2067 2412                              | 0.3343<br>0.3116        | 0.9165           | 225.84                               | 2427~<br>2439             | 0.687                 | 0.687           |
|                           | 2757                                   | 0.2991                  | 0.9471           |                                      | 2480                      | 0.5844                | 0.7879          |
|                           | 3102<br>3446                           | 0.2778                  | 0.9555           |                                      | 2571<br>2647              | 0.5465                | 0.8175          |
|                           | 3791                                   | 0.2510                  | -                |                                      | 2757                      | 0.4983                | 0.8551          |
| 210.62                    | 4135<br>1420 <sup>b</sup>              | 0.2415                  | -                |                                      | 3102<br>3446              | 0.4435                | 0.8934          |
|                           | 1447                                   | 0.5426                  | 0.7198           |                                      | 3791                      | 0.3779                | 0.9289          |
|                           | 1516<br>1654                           | 0.5151                  | 0.7643           | 231 83                               | 4135<br>2840 <sup>b</sup> | 0.3541                | 0.9335          |
|                           | 1791                                   | 0.4400                  | 0.8494           | 231.03                               | 2843                      | -                     | 0.7161          |
|                           | 1929<br>2205                           | 0.4182                  | 8993.0<br>8996   |                                      | 2860                      | 0.6325                | 0.7667          |
|                           | 2412                                   | 0.3635                  | -                |                                      | 2964                      | 0.5730                | 0.8201          |
|                           | 2757<br>3102                           | 0.3385                  | _<br>0 9412      |                                      | 3102<br>3446              | 0.5336                | 0.8457          |
|                           | 3446                                   | 0.3020                  | 0.9515           |                                      | 3708                      | 0.4463                | 0.9013          |
|                           | 3743                                   | 0.2846                  | 0.9592           |                                      | 3791                      | 0.4322                | 0.9119          |
|                           | 3998                                   | 0.2740                  | 0.9604           |                                      | 4135                      | 0.4013                | 0.9249          |
|                           | 4135                                   | 0.2719                  | 0.9647           |                                      | 4488                      | 0.3802                | 0.9375          |
|                           | 4287                                   | 0.2502                  | 0.9707           |                                      | 5514                      | 0.3319                | 0.9593          |
|                           | 5115                                   | 0.2373                  | 0.9740           |                                      | 5521                      | 0.3332                | 0.9579          |
|                           | 6072                                   | 0.2235                  | 0.9804           |                                      | 6224                      | 0.3135                | 0.9665          |
|                           | 6562                                   | 0.2022                  | 0.9838           |                                      | 6693                      | 0.2950                | 0.9702          |
|                           | 7582                                   | 0.1831                  | 0.9858           |                                      | 7182                      | 0.2816                | 0.9766          |
|                           | 8140                                   | 0.1741                  | 0.9885           |                                      | 8010                      | 0.2538                | 0.9784          |
|                           | 83/5<br>8547                           | 0.1728                  | 0.9887           |                                      | 8554<br>9078              | 0.2430<br>0.2330      | 0.9809          |
|                           | 8967                                   | 0.1687                  | 0.9897           |                                      | 9636                      | 0.2247                | 0.9849          |
|                           | 9208<br>9422 <sup>a</sup>              | 0.1591<br>0.158         | 0.999            |                                      | 9761<br>10133             | 0.2214<br>0.2159      | 0.9853          |
|                           |                                        |                         |                  |                                      |                           |                       |                 |

| COMPONENTS:               |                                    |                            |                             | ORIGINAL MEASUREMENTS:                                                       |                   |                              |                             |
|---------------------------|------------------------------------|----------------------------|-----------------------------|------------------------------------------------------------------------------|-------------------|------------------------------|-----------------------------|
| (l) Helium; He; 7440-59-7 |                                    |                            |                             | Streett, W. B., Erickson, A. L., and<br>Hill, J. L. E., <i>Physics Earth</i> |                   |                              |                             |
| (2) M                     | 1ethane; CH <sub>4</sub> ; 74-82-8 |                            |                             | Planetary Interiors, <u>1972</u> , 6, 69.                                    |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
| EXPERI                    | MENTAL V                           | ALUES:                     |                             |                                                                              |                   |                              |                             |
| m / 12                    | 7 /ham                             | Mole fraction              | of helium                   | m / v                                                                        | P/ham             | Mole fraction                | of helium                   |
| 17K                       | r/Dar                              | и папа,<br><sup>ж</sup> но | л vapor,<br><sup>у</sup> но | 1/K                                                                          | r/bai             | и пацита,<br><sup>ж</sup> но | и vapor,<br><sup>у</sup> но |
| <u></u>                   | b                                  |                            |                             |                                                                              |                   | ne                           | ne                          |
| 239.95                    | 3474~<br>3515                      | 0.706<br>0.6294            | 0.706<br>0.8021             | 256.49                                                                       | 5039<br>5170      | 0.5936<br>0.5686             | 0.8501                      |
|                           | 3557                               | 0.5971                     | 0.8201                      |                                                                              | 5445              | 0.5281                       | 0.8896                      |
|                           | 3653                               | 0.5621                     | 0.8431                      |                                                                              | 5859              | 0.4851                       | 0.9111                      |
|                           | 4135.                              | 0.4768                     | 0.8963                      |                                                                              | 6802              | 0.4156                       | 0.9339                      |
| 243.20                    | 3708 <sup>b</sup>                  | 0.710                      | 0.710                       |                                                                              | 6893              | 0.4135                       | 0.9417                      |
|                           | 3722                               | -                          | 0.7490                      |                                                                              | 7444              | 0.3833                       | 0.9494                      |
|                           | 3756                               | 0.6226                     | 0.7951                      |                                                                              | 7988              | 0.3605                       | 0.9566                      |
|                           | 3/91                               | 0.6052                     | 0.8130                      |                                                                              | 8554              | 0.3404                       | 0.9625                      |
|                           | 3859                               | 0.5770                     | 0.8352                      |                                                                              | 9657              | 0.3074                       | 0.9708                      |
|                           | 3914                               | 0.5646                     | 0.8446                      |                                                                              | 10049             | 0.2958                       | 0.9737                      |
|                           | 3997                               | 0.5451                     | 0.8576                      | 273.0                                                                        | 6342 <sup>D</sup> | 0.746                        | 0.746                       |
| 244 24                    | 4135<br>2701b                      | 0.5179                     | 0.8762                      |                                                                              | 6417              | 0.6525                       | 0.8342                      |
| 244.24                    | 3805                               | 0.6588                     | 0.712                       |                                                                              | 6549              | 0.6272                       | 0.8461                      |
|                           | 3859                               | 0.6079                     | 0.8136                      |                                                                              | 6700              | 0.5899                       | 0.8718                      |
|                           | 3997                               | 0.5651                     | 0.8426                      |                                                                              | 6906              | 0.5593                       | 0.8862                      |
|                           | 4135                               | 0.5340                     | 0.8639                      |                                                                              | 7245              | 0.5220                       | 0.9056                      |
| 244 24                    | 4488                               | 0.4955                     | 0.8921                      |                                                                              | 7727              | 0.4836                       | 0.9221                      |
| 244.24                    | 5514                               | 0.4083                     | 0.9324                      |                                                                              | 8265              | 0.4508                       | 0.9346                      |
|                           | 5996                               | 0.3801                     | 0.9420                      |                                                                              | 8829              | 0.4210                       | 0.9454                      |
|                           | 6555                               | 0.3534                     | 0.9546                      |                                                                              | 9306 <sub>h</sub> | 0.4041                       | 0.9484                      |
|                           | 7169                               | 0.3295                     | 0.9622                      | 290.0                                                                        | 8175              | 0.753                        | 0.753                       |
|                           | 7720                               | 0.3111                     | 0.9678                      |                                                                              | 8292              | 0.6337                       | 0.8633                      |
|                           | 8829                               | 0.2806                     | 0.9749                      |                                                                              | 8423              | 0.6245                       | 0.8679                      |
|                           | 9519                               | 0.2666                     | 0.9771                      |                                                                              | 8478              | 0.600                        | 0.8769                      |
|                           | 9912                               | 0.2572                     | 0.9794                      |                                                                              | 8575              | 0.5874                       | 0.8852                      |
|                           | 10064 <sub>b</sub>                 | 0.2479                     | -                           |                                                                              | 8753              | 0.5670                       | 0.8933                      |
| 256.49                    | 4811                               | 0.732                      | 0./32                       |                                                                              | 9126              | 0.5344                       | 0.9083                      |
|                           | 4913                               | 0.6094                     | 0.8365                      |                                                                              | 9554<br>10133     | 0.5028                       | 0.9221                      |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           | <sup>a</sup> Thre                  | e phase pressu             | re ± 10 ba                  | r.                                                                           |                   |                              |                             |
|                           | <sup>b</sup> Crit                  | ical pressure              | ± 20 bar.                   |                                                                              |                   |                              |                             |
|                           |                                    | •                          |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
|                           |                                    |                            |                             |                                                                              |                   |                              |                             |
| COMPONENT | ç.                 |                                        |                     | OPTOTNAL            | A CUDEN         | ENTC .                      |                 |
|-----------|--------------------|----------------------------------------|---------------------|---------------------|-----------------|-----------------------------|-----------------|
| COMPONENT | 5.                 |                                        |                     | UKIGINAL I          | MEASUKEM        | EN19:                       |                 |
| (1) He    | lium:              | He; 7440-01-9                          |                     | DeVanev             | . W. E.         | , Rhodes. H.                | L. and          |
|           |                    |                                        |                     | Tully,              | P. C.,          | J. Chem. Engn               | g. Data,        |
| (2) Me    | thane;             | CH <sub>4</sub> ; 74-82-8              |                     | <u>1971</u> , 1     | 6, 158.         | •                           |                 |
|           |                    |                                        |                     |                     |                 |                             |                 |
|           |                    |                                        |                     |                     |                 |                             |                 |
| VARIABLES | 5:                 |                                        |                     | PREPARED            | BY:             |                             |                 |
| Tempera   | ture, p            | pressure                               |                     | С. L. Y             | oung            |                             |                 |
|           |                    |                                        |                     |                     |                 |                             |                 |
| EXPERIMEN | TAL VALL           | IES:                                   |                     |                     |                 |                             |                 |
|           | - 4                | Mole fraction                          | of helium           |                     |                 | Mole fraction               | of helium       |
| T/K       | <i>P/</i> bar      | in liquid,                             | in vapor,           | T/K                 | P/bar           | in liquid,                  | in vapor,       |
|           |                    | "He                                    | <sup>9</sup> He     |                     |                 | "Не                         | <sup>9</sup> He |
| 124.00    | 13.92              | 0.0015                                 | -                   | 164.00              | 24.34           | -                           | 0.1643          |
|           | 13.99<br>20 81     | 0.0024                                 | 0.7996              |                     | 27.65           | -                           | 0.2380          |
|           | 27.57              | 0.0031                                 | -                   |                     | 34.47           | 0.0078                      | -               |
|           | 27.64              | -<br>0 0035                            | 0.8963              |                     | 34.54           | -                           | 0.3578          |
|           | 41.08              | 0.0044                                 | 0.9155              |                     | 41.09           | 0.0108                      | 0.4404          |
|           | 41.36              | -                                      | 0.9282              |                     | 48.19           | -                           | 0.5050          |
|           | 54.87              | 0.0060                                 | -<br>0.9452         |                     | 48.26<br>55.71  | 0.0139                      | 0.5594          |
| 1.54.55   | 69.02              | 0.0079                                 | -                   |                     | 68.88           | 0.0238                      | -               |
| 154.00    | 13.79              | 0.0001                                 | 0.0644              | 174.00              | 31.16           | 0.0027                      | 0 0796          |
|           | 20.89              | 0.0028                                 | 0.3321              |                     | 34.54           | 0.0057                      | 0.1332          |
|           | 27.36              | 0.0050                                 | -<br>0 4742         |                     | 41.16           | 0.0105                      | -<br>0 2274     |
|           | 34.20              | 0.0072                                 |                     |                     | 48.26           | -                           | 0.3028          |
|           | 34.54              | -                                      | 0.5640              |                     | 48.33           | 0.0150                      | -               |
|           | 41.58              | -                                      | 0.6285              |                     | 62.12           | -                           | 0.4149          |
|           | 55.50              | 0.0148                                 | _<br>0 7121         |                     | 62.19           | 0.0246                      | -               |
|           | 68.88              | 0.0192                                 | -                   | 184.00              | 41.23           | 0.0038                      |                 |
| 164.00    | 20.89              | 0.0006                                 | 0.0683              |                     | 41.37           | -                           | 0.0393          |
|           | 24.27              | 0.0020                                 | -                   |                     | 40.20           | 0.0122                      | -               |
|           |                    |                                        | AUXILIARY           | INFORMATI           | ON              |                             |                 |
| METHOD /  | APPARAT            | US/PROCEDURE:                          |                     | SOURCE AN           | D PURITY        | OF MATERIALS:               |                 |
| Recircu   | lating             | vapor flow ap                          | paratus.            | 1. Bure             | au of M         | lines high pur              | itv sample      |
| Berylli   | um copp            | per widowed ce                         | 11. Vapor           | puri                | ty bett         | er than 99.99               | 9 mole per      |
| Tempera   | lated t<br>ture me | hrough externations as ured with place | al loop.<br>latinum | cent                | •               |                             |                 |
| resista   | nce the            | ermometer and p                        | pressure            | 2. Ultr             | apure g         | grade at least              | 99.99<br>oxygen |
| Bourdon   | d by pr<br>gauge.  | Details ret                            | ucer and<br>f. l.   | and                 | nitroge         | en).                        | 0               |
|           | 550                |                                        |                     |                     |                 |                             |                 |
|           |                    |                                        |                     |                     |                 |                             |                 |
|           |                    |                                        |                     |                     |                 |                             |                 |
|           |                    |                                        |                     | ECTTV A TO          |                 |                             |                 |
|           |                    |                                        |                     | $\delta T/K =$      | ±0,01•          | $\delta P/bar = \pm 0$      | 07:             |
| ļ         |                    |                                        |                     | $\delta x \simeq 0$ | $\delta u =$    | ±0.005%                     |                 |
|           |                    |                                        |                     | "Не                 | He              |                             |                 |
|           |                    |                                        |                     | REFERENC            | ES:             |                             |                 |
|           |                    |                                        |                     |                     |                 |                             |                 |
|           |                    |                                        |                     | 1. Tull             | у, Р. С         | ., DeVaney, W               | . E. and        |
|           |                    |                                        |                     | <u>1971</u>         | <i>, 16</i> , 8 | 1., <i>AUD. CPyD</i><br>88. | yenro bny.,     |
|           |                    |                                        |                     |                     |                 |                             |                 |
| ]         |                    |                                        |                     | 1                   |                 |                             |                 |

| COMPONE | NTS:          |                 |             | ORIGINAL MEASUREMENTS:                                                   |
|---------|---------------|-----------------|-------------|--------------------------------------------------------------------------|
| (1) He  | lium; H       | le; 7440-59-7   |             | DeVaney, W. E., Rhodes, H. L. and<br>Tully, P. C., J. Chem. Engng. Data. |
| (2) Me  | thane; (      | СН4; 74-82-8    |             | <u>1971</u> , <i>16</i> , 158.                                           |
|         |               |                 |             |                                                                          |
|         |               |                 |             |                                                                          |
| EXPERIM | ENTAL V       | ALUES:          |             |                                                                          |
|         |               | Mole fraction   | of helium   | L                                                                        |
| T/K     | <i>P/</i> bar | in liquid,      | in vapor,   |                                                                          |
|         |               | $x_{\text{He}}$ | ${}^{y}$ He |                                                                          |
|         |               |                 |             | _                                                                        |
| 184.00  | 48.33         | -               | 0.1039      |                                                                          |
|         | 55.02         | 0.0196          | -           |                                                                          |
|         | 55.57         | -               | 0.1626      |                                                                          |
|         | 62.19         | 0.0280          | -           |                                                                          |
|         | 62.26         | -               | -           |                                                                          |
| 186 00  | 10 26         | 0.0353          | 0.2092      |                                                                          |
| 100.00  | 48.13         | 0.0088          | -           |                                                                          |
|         | 48.26         | -               | 0.0398      |                                                                          |
| 189.00  | 49.71         | 0.0100          | _           |                                                                          |
|         | 49.78         | -               | 0.0363      |                                                                          |
|         | 55.16         | 0.0196          | -           |                                                                          |
|         | 55.23         | -               | 0.0679      |                                                                          |
|         | 62.19         | 0.0316          | -           |                                                                          |
|         | 68.95         | 0.0429          | U.1064<br>- |                                                                          |
| 190.30  | 55.09         | 0.0215          | -           |                                                                          |
|         | 55.16         | -               | 0.0435      |                                                                          |
|         | 62.12         | 0.0368          | -           |                                                                          |
|         | 62.26         | -               | 0.0736      |                                                                          |
| 100 60  | 68.81         | 0.0511          | -           |                                                                          |
| TA0.00  | 55.23         | -               | 0.033I      |                                                                          |
|         | 62.05         | 0.0250          | -           |                                                                          |
|         | 62.12         | -               | 0.0596      |                                                                          |
|         | 68.88         | 0.0587          | -           |                                                                          |
|         |               |                 |             |                                                                          |

| COMPONENT         | ·C •                   | ······                       |                     | OPTOTNAL                       | MEA CUDEMEN           | тс <b>.</b>                     |                        |
|-------------------|------------------------|------------------------------|---------------------|--------------------------------|-----------------------|---------------------------------|------------------------|
| COMPONENT         | .5:                    |                              |                     | URIGINAL                       | MEASUREMEN            | 15:                             |                        |
| (1) He            | lium; He;              | ; 7440-59-7                  |                     | Heck, C                        | . K. and              | Hiza, M. J.                     | ,                      |
| (2) Me            | thane: CH              | Hu: 74-82-8                  |                     | Am. Ins                        | t. Chem.              | Engnrs. J.,                     | 1967,                  |
| (-,               |                        |                              |                     | 13, 593                        | •                     |                                 |                        |
|                   |                        |                              |                     |                                |                       |                                 |                        |
|                   |                        |                              |                     |                                |                       |                                 |                        |
| VARIABLE          | 5:                     |                              |                     | PREPARED                       | BY:                   |                                 |                        |
| Tempera           | ture, pres             | ssure                        |                     | C. L. Y                        | oung                  |                                 |                        |
|                   |                        |                              |                     |                                |                       |                                 | ······                 |
| EXPERIMEN         | NTAL VALUES:<br>Mo     | :<br>le fraction             | of helium           |                                | Мо                    | ole fraction                    | of helium              |
| т/к               | P/bar in               | liquid,                      | in vapor,           | т/к                            | P/bar in              | n liquid,                       | in vapor,              |
|                   |                        | $x_{\text{He}}$              | <sup>y</sup> He     |                                |                       | xHe                             | ${}^{y}$ He            |
| 94.97             | 4.81                   | 0.00012                      | 0.9580              | 139.83                         | 82.88                 | 0.0163                          | 0.9055                 |
| ±0.02             | 10.18                  | 0.00034                      | 0.9810              | ±0.03                          | 113.5<br>144 3        | 0.0214                          | 0.9258                 |
|                   | 40.28                  | 0.00136                      | 0.99405             |                                | 174.3                 | 0.0304                          | 0.9477                 |
|                   | 60.80<br>69.91         | -                            | 0.99566             | 169.81                         | 201.6                 | 0.0341                          | 0.9527                 |
|                   | 85.72                  | 0.00274                      | 0.99637             | ±0.05                          | 56.03                 | 0.0206                          | 0.469                  |
|                   | 91.50<br>119.0         | 0.00285                      | -<br>0.99747        |                                | 58.77<br>67.79        | 0.0217<br>0.0261                | -                      |
|                   | 144.5                  | 0.00419                      | 0.99769             |                                | 83.09                 | 0.0352                          | 0.601                  |
|                   | 164.0<br>182.8         | 0.00472                      | 0.99804             |                                | 108.6                 | 0.0469                          | 0.669                  |
| 124 05            | 194.5                  | 0.00524                      | -                   |                                | 143.8                 | 0.0612                          | 0.738                  |
| ±0.03             | 20.47                  | 0.00216                      | 0.857               |                                | 198.5                 | 0.0806                          | -                      |
| ļ                 | 40.73                  | 0.00499                      | 0.9210              | 109.90                         | 20.42                 | 0.00151                         | 0.9537                 |
|                   | 86.63                  | -0.0104                      | 0.9605              | -0.02                          | 41.54                 | 0.00304                         | 0.9756                 |
|                   | 113.7<br>144.4         | 0.0131                       | 0.9693              |                                | 71.23<br>90.99        | 0.00488<br>0.00604              | 0.9851                 |
| [                 | 174.0                  | 0.0184                       | 0.9778              |                                | 102.8                 | -                               | 0.9892                 |
| 139.83            | 204.0 23.10            | 0.0209<br>0.00447            | 0.9799              |                                | 103.4<br>133.1        | 0.00679                         | 0.99052                |
| ±0.03             | 39.72                  | 0.00789                      | 0.812               |                                | 164.8                 | 0.00978                         | 0.99178                |
|                   | 03.23                  | -                            | 0.070               |                                | 193.0                 | 0.0111                          | -                      |
|                   |                        |                              | AUXILIARY           | INFORMATI                      | ON                    |                                 |                        |
| METHOD /          | APPARATUS/             | PROCEDURE :                  |                     | SOURCE AN                      | ND PURITY C           | OF MATERIALS:                   |                        |
| Vapor r           | ecirculate             | ed through d                 | cell.               | 1. Bure                        | au of Mir             | nes grade A                     | sample                 |
| Liquid<br>gas chr | and vapor              | samples and                  | alysed by           | 0.01                           | 5 mole pe             | er cent neon                    | •                      |
| red by I          | Bourdon ga             | auge and ten                 | perature            | 2. Two<br>than                 | samples u<br>99.8 mol | used, puriti<br>Le per cent     | es better<br>and 99.95 |
| thermom           | d with pla<br>eter. De | atinum resis<br>etails in so | stance<br>ource and | mole                           | per cent              | (no differ                      | ence de-               |
| ref. l.           |                        |                              |                     | samp                           | ed in res<br>les).    | sults using                     | different              |
|                   |                        |                              |                     | -                              |                       |                                 |                        |
|                   |                        |                              |                     |                                |                       |                                 |                        |
|                   |                        |                              |                     |                                |                       |                                 |                        |
|                   |                        |                              |                     | ESTIMATE                       | D ERROR:              |                                 |                        |
|                   |                        |                              |                     | $\delta T/K =$<br>100 bar      | ±0.05; &<br>) = ±0.03 | $P/bar = \pm 0.$<br>(above 100) | l (up to<br>bar):      |
| 1                 |                        |                              |                     | <sup>δ</sup> π <sub>He</sub> ≃ | δ(1-y) <sub>He</sub>  | = ±3% of va                     | lue or                 |
| 1                 |                        |                              |                     | ±0.0000                        | 2 (whiche<br>ES:      | <u>ver is grea</u>              | test).                 |
|                   |                        |                              |                     | IL Horr                        | ing P N               | I and Barri                     | ck D T                 |
|                   |                        |                              |                     | A dm                           | Crucceri              | c Enana 1                       | 965. 10                |
|                   |                        |                              |                     | 151.                           | Jugenu                |                                 | <u></u> ,,             |
|                   |                        |                              |                     |                                |                       |                                 |                        |
|                   |                        |                              |                     |                                |                       |                                 |                        |

| 7440-59-7<br>74-82-8                                                                                                                                                                                                                                                     | Heck, C. K. and Hiza, M. J.,<br>Am. Inst. Chem. Engnrs. J., <u>1967</u> ,<br>13, 593.                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5:                                                                                                                                                                                                                                                                       | <u> </u>                                                                                                                                                                                                                                                                                                                                                                  |
| e fraction of helium<br>liquid, in gas,<br><sup>x</sup> He <sup>y</sup> He                                                                                                                                                                                               | 1                                                                                                                                                                                                                                                                                                                                                                         |
| - 0.99279<br>0.212<br>0.0103 -<br>0.0130 0.632<br>0.0189 -<br>- 0.785<br>0.0235 -<br>0.0319 -<br>- 0.838<br>0.0413 0.871<br>0.0480 0.892<br>0.0537 0.900<br>- 0.0693<br>0.0352 0.212<br>- 0.331<br>0.0558 -<br>0.0773 0.436<br>0.111 0.519<br>0.126 0.562<br>0.137 0.592 |                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                          | 7440-59-7<br>74-82-8<br>fraction of helium<br>liquid, in qas,<br><sup>x</sup> He <sup>y</sup> He<br>- 0.99279<br>- 0.212<br>0.0103 -<br>0.0130 0.632<br>0.0189 -<br>0.785<br>0.0235 -<br>0.0319 -<br>0.838<br>0.0413 0.871<br>0.0480 0.892<br>0.0537 0.900<br>- 0.0693<br>0.0352 0.212<br>- 0.331<br>0.0558 -<br>0.773 0.436<br>0.111 0.519<br>0.126 0.562<br>0.137 0.592 |

| COMPONENTS:                                                   | ORIGINAL MEASUREMENTS:                                                                               |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (1) Helium; He; 7440-59-7                                     | Gonikberg, M. G. and Fastowski, V. G.<br>Acta Physicochimica URSS, 1940, 13,                         |
| (2) Methane; CH4;74-82-8                                      | 399.                                                                                                 |
|                                                               |                                                                                                      |
| VARIABLES:                                                    | PREPARED BY:                                                                                         |
| Temperature, pressure                                         | C. L. Young                                                                                          |
| EXPERIMENTAL VALUES:                                          |                                                                                                      |
| T/K P/bar Mole fra                                            | ction of helium in liquid, $x_{He}$                                                                  |
| 90.3 29.4                                                     | 0.0013                                                                                               |
| 96.1                                                          | 0.0032                                                                                               |
| 113.8                                                         | 0.0037                                                                                               |
| 158.9                                                         | 0.0052                                                                                               |
| 106.0 25.5<br>59.8                                            | 0.0019<br>0.0039                                                                                     |
| 98.1                                                          | 0.0063                                                                                               |
| 140.1                                                         | 0.0097                                                                                               |
|                                                               |                                                                                                      |
| AUXILIARY                                                     | INFORMATION                                                                                          |
| METHOD/APPARATUS/PROCEDURE:                                   | SOURCE AND PURITY OF MATERIALS:                                                                      |
| Recirculating vapor flow apparatus.                           | 1. Purity 99.8 mole per cent.                                                                        |
| analysed by adsorption on charcoal<br>then removal of helium. | 2. Purity 99.6 mole per cent.                                                                        |
|                                                               |                                                                                                      |
|                                                               |                                                                                                      |
|                                                               |                                                                                                      |
| ļ                                                             | ESTIMATED ERROR:                                                                                     |
|                                                               | $\begin{array}{llllllllllllllllllllllllllllllllllll$                                                 |
|                                                               | REFERENCES:<br>1. Sokolov, V. A. "Methods for<br>investigation of natural gases."<br>1932 (Russian). |
|                                                               |                                                                                                      |

| COMPONENTS:  |              |                          |                 | ORIGINAL        | MEASUREME          | ENTS:          |                 |
|--------------|--------------|--------------------------|-----------------|-----------------|--------------------|----------------|-----------------|
| (l) Heliu    | um; He       | e; 7440-59-              | 7               | Nikitir         | na, I. E           | ., Skripka, V. | G.,             |
| (-)          |              |                          |                 | Gubkins         | - C F              | Sirotin A      | G and           |
| (2) Ethai    | ne; C        | 2H <sub>6</sub> ; 74-84- | 0               |                 | ., G. r.           |                | G. and          |
|              |              |                          |                 | Ben'yan         | ainovic,           | 0. A., Gazov.  | Prom.,          |
|              |              |                          |                 | <u>1970</u> , 1 | 15, No.            | 6,35.          |                 |
|              |              |                          |                 |                 |                    |                |                 |
| VARIABLES:   |              |                          |                 | P REPARED       | BY:                |                |                 |
| Dompowstur   |              |                          |                 |                 |                    |                |                 |
| Temperatu    | re, pre      | essure                   |                 | С. Ц. Х         | oung               |                |                 |
|              |              |                          |                 |                 |                    |                |                 |
| EXPERIMENTAL | VALUES       | :                        |                 |                 |                    |                |                 |
|              | MO<br>har in | le fraction              | of helium       | m /v            | D /ham             | Mole fraction  | of helium       |
| 1/К 1/       | Dai in       | $x_{}$                   | $u_{-}$         | TYK             | P/bar              | in liquid,     | in vapor,       |
|              |              | He                       | <sup>5</sup> He |                 |                    | "Не            | <sup>9</sup> He |
| 273.15 2     | 9.4          | 0.00297                  | 0.145           | 233.15          | 19.6               | 0.00315        | 0.569           |
| 3            | 9.2          | 0.00704                  | 0.328           |                 | 39.2               | 0.00681        | 0.784           |
| 5            | 8.8          | 0.01284                  | 0.477           |                 | 58.8               | 0.00947        | 0.857           |
| /            | 8.5<br>0 1   | 0.01670                  | 0.566           |                 | 78.5               | 0.01158        | 0.896           |
| 11           | 7.7          | 0.02177                  | 0.635           |                 | 117 7              | 0.01340        | 0.915           |
| 263.15 1     | 9.6          | 0.00060                  | 0.037           | 223.15          | 9.8                | 0.00108        | 0.389           |
| 3            | 9.2          | 0.00800                  | 0.475           |                 | 19.6               | 0.00315        | 0.681           |
| 5            | 8.8          | 0.01240                  | 0.618           |                 | 39.2               | 0.00626        | 0.849           |
| ^            | 8.5<br>g 1   | 0.01550                  | 0.696           |                 | 58.8               | 0.00852        | 0.906           |
| 11           | 7.7          | 0.01990                  | 0.794           |                 | 78.5<br>98.1       | 0.01027        | 0.928           |
| 253.15 1     | 9.6          | 0.00215                  | 0.188           |                 | 117.7              | 0.01329        | 0.948           |
| 3            | 9.2          | 0.00771                  | 0.581           | 213.15          | 4.9                | 0.00028        | 0.200           |
| 5            | 8.8          | 0.01140                  | 0.714           |                 | 9.8                | 0.00133        | 0.570           |
| 9            | 8.1          | 0.01407                  | 0.779           |                 | 19.6               | 0.00300        | 0.790           |
| 11           | 7.7          | 0.01822                  | 0.850           |                 | 58.8               | 0.00548        | 0.034           |
| 243.15 19    | 9.6          | 0.00305                  | 0.360           |                 | 78.5               | 0.00897        | 0.949           |
| 39           | 9.2          | 0.00745                  | 0.674           |                 | 98.1               | 0.01035        | 0.960           |
| 58           | 8.8<br>D E   | 0.01050                  | 0.781           | 102 15          | 117.7              | 0.01170        | 0.966           |
| 98           | 8.1          | 0.01290                  | 0.875           | 193.15          | 4.9<br>9 8         | 0.00043        | 0.570           |
| 11           | 7.7          | 0.01679                  | 0.894           |                 | 19.6               | 0.00219        | 0.916           |
| 233.15       | 9.8          | 0.00060                  | 0.182           |                 | 39.2               | 0.00408        | 0.957           |
|              |              |                          |                 |                 |                    |                |                 |
|              |              |                          | AUXILIARY       | INFORMATI       | ON                 |                |                 |
| METHOD/APPA  | ARATUS       | PROCEDURE:               |                 | SOURCE AN       | ND PURITY          | OF MATERIALS:  |                 |
| Recirculat   | ting va      | nor flow an              | paratus         | 1. Puri         | tv 99.9            | mole per cent  |                 |
| fitted wit   | th stir      | rer. Temp                | erature         |                 | . Ly 99.9          |                | •               |
| measured w   | vith pl      | atinum resi              | stance          | 2. Puri         | ty 99.5            | mole per cent  | •               |
| thermomete   | er. L        | iquid and g              | as phases       |                 |                    |                |                 |
| analysed b   | oy gas       | chromatogra              | phy using       |                 |                    |                |                 |
| Details in   |              | e and ref.               | 1.              |                 |                    |                |                 |
| Decurro II   | Dourd        |                          |                 |                 |                    |                |                 |
|              |              |                          |                 |                 |                    |                |                 |
|              |              |                          |                 |                 |                    |                |                 |
|              |              |                          |                 |                 |                    |                |                 |
|              |              |                          |                 | FOTTMATE        |                    |                |                 |
| 1            |              |                          |                 | LOITMATE        | $\pm 0.2$          | \$D/bar _ +19. | £               |
|              |              |                          |                 | 01/K =          | -∪.2;              | vr/bar = II8;  | "He =           |
|              |              |                          |                 | ±0.5%;          | δ(1-9 <sub>H</sub> | e) = ±2.0%.    |                 |
|              |              |                          |                 | DEPENDING       |                    | <u> </u>       |                 |
|              |              |                          |                 | REFERENC        | L5:                |                |                 |
|              |              |                          |                 | l. Skri         | pka, V.            | G., Barsuk, S  | . D.,           |
|              |              |                          |                 | Niki            | tina, I            | . E. and Ben'y | aminovic,       |
|              |              |                          |                 | 0. A            | ., Gazo            | v. Prom., 1964 | , 14,           |
|              |              |                          |                 | No              | 4. 41              |                | -               |
|              |              |                          |                 | NO.             | .,                 |                |                 |

| COMPONE          | NTS:               |                                                |                                           | ORIGINAL MEASUREMENTS:                                                                                                                                        |
|------------------|--------------------|------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) He<br>(2) Et | lium; H<br>hane; C | e; 7440-59-7<br>2H6; 74-84-0                   |                                           | Nikitina, I. E., Skripka, V. G.,<br>Gubkina, G. F., Sirotin, A. G. and<br>Ben'yaminovic, O. A., <i>Gazov. Prom.</i> ,<br><u>1970</u> , <i>15</i> , No. 6, 35. |
|                  |                    |                                                |                                           |                                                                                                                                                               |
| EXPERIM          | ENTAL V            | ALUES:                                         |                                           |                                                                                                                                                               |
| т/к              | P/bar              | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He | ۱<br>۰                                                                                                                                                        |
| 193.15           | 58.8               | 0.00560                                        | 0.972                                     |                                                                                                                                                               |
| -                | 78.5               | 0.00683                                        | 0.978                                     |                                                                                                                                                               |
| 173.15           | 4.9                | 0.00911<br>0.00037                             | 0.987                                     |                                                                                                                                                               |
|                  | 9.8<br>19.6        | 0.00072                                        | 0.950                                     |                                                                                                                                                               |
|                  | 39.2<br>58.8       | 0.00273                                        | 0.986                                     |                                                                                                                                                               |
|                  | 78.5<br>98.1       | 0.00479<br>0.00562                             | 0.994<br>0.995                            |                                                                                                                                                               |
| 153.15           | 4.9                | 0.00642                                        | 0.996                                     |                                                                                                                                                               |
|                  | 9.8<br>19.6        | 0.00045<br>0.00090                             | 0.986<br>0.993                            |                                                                                                                                                               |
|                  | 39.2<br>58.8       | 0.00182<br>0.00258                             | 0.997<br>0.998                            |                                                                                                                                                               |
|                  | 78.5<br>98.1       | 0.00323<br>0.00385                             | 0.998<br>0.998                            |                                                                                                                                                               |
| 133.15           | 117.7<br>4.9       | 0.00440<br>0.00010                             | 0.999<br>0.996                            |                                                                                                                                                               |
|                  | 9.8<br>19.6        | 0.00021<br>0.00042                             | 0.998<br>0.998                            |                                                                                                                                                               |
|                  | 39.2<br>58.8       | 0.00084<br>0.00128                             | -                                         |                                                                                                                                                               |
|                  | 78.5<br>98.1       | 0.00170<br>0.00213                             | -                                         |                                                                                                                                                               |
| 113.15           | 117.7              | 0.00257                                        | -                                         |                                                                                                                                                               |
|                  | 9.8                | 0.00008                                        | _                                         |                                                                                                                                                               |
|                  | 39.2               | 0.00034                                        | -                                         |                                                                                                                                                               |
|                  | 78.5               | 0.00068                                        | -                                         |                                                                                                                                                               |
|                  | 117.7              | 0.00102                                        | -                                         |                                                                                                                                                               |
|                  |                    |                                                |                                           | -                                                                                                                                                             |
|                  |                    |                                                |                                           |                                                                                                                                                               |
|                  |                    |                                                |                                           |                                                                                                                                                               |
|                  |                    |                                                |                                           |                                                                                                                                                               |

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COMPONENTS: ORIGINAL MEASUREMENTS: Schindler, D. L., Swift, G. W. and (1) Helium; He; 7440-59-7 Kurata, F., Hydrocarbon Process., Propane; C<sub>3</sub>H<sub>8</sub>; 74-98-6 1966, 45, no.11, 205. (2) VARIABLES: PREPARED BY: C. L. Young Temperature, pressure **EXPERIMENTAL VALUES:** Mole fraction of helium Mole fraction of helium т/к P/bar in liquid, in gas, т/к P/bar in liquid, in gas,  $x_{\rm He}$  $y_{\rm He}$  $x_{\text{He}}$ <sup>y</sup><sub>He</sub> 348.15 0.221 96.53 41.37 0.0132 273.15 0.0266 0.9444 0.0396 124.1 0.9540 68.95 0.432 0.0331 96.53 0.0625 0.550 151.7 0.0392 0.9600 124.1 179.3 0.0449 0.0826 0.633 0.9646 151.7 179.3 0.0506 0.101 0.694 206.8 0.9688 248.15 0.737 13.79 0.0025 0.118 0.831 206.8 0.134 0.763 41.37 0.0080 0.9414 323.15 41.37 0.0150 0.495 68.95 0.0133 0.9642 0.0183 0.9739 68,95 0.671 96.53 0.0311 96.53 0.0462 0.756 124.1 0.0230 0.9791 124.1 0.806 0.9822 0.0601 151.7 0.0274 151.7 0.839 0.9839 0.0730 179.3 0.0315 0.860 0.9847 179.3 0.0847 206.8 0.0354 0.0018 206.8 0.0953 0.874 223.15 13.79 0.9387 298.15 13.79 0.0020 0.253 41.37 0.0055 0.9815 0.9884 41.37 68.95 0.0089 0.0139 0.721 68.95 0.0246 0.831 96.53 0.0122 0.9905 0.879 0.9913 96.53 0.0343 124.1 0.0153 124.1 0.9047 0.9920 0.0435 151.7 0.0182 151.7 0.0523 0.9204 179.3 0.0210 0.9929 179.3 0.0611 0.9304 206.8 0.0238 0.9942 206.8 0.0702 0.9365 198.15 13.79 0.0011 0.9820 13.79 0.0033 0.9920 273.15 0.0030 0.624 41.37 41.37 0.0117 0.877 68.95 0.0054 0.9961 68.95 0.0195 0.9255 96.53 0.0074 0.9971 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD / APPARATUS / PROCEDURE: 1. Minimum purity 99.9988 mole per Static equilibrium cell with magnetic Temperature measured with stirrer. cent. platinum resistance thermometer; 2. Instrument grade sample. pressure measured with Bourdon gauge. Propane charged into cell helium added Samples of both phases analysed by gas chromatography. Details of apparatus in ref. 1. ESTIMATED ERROR:  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.15;$  $\delta x_{He} = \pm 1.5 \text{ to } 4\%; \quad \delta y_{He} = \pm 2\%.$ **REFERENCES:** 1. Sinor, J. E., Schindler, D. L. and Kurata, F., Am. Inst. Chem. Engng. J., 1966, 12, 357.

| }       |                |                      |                         |                                                                         |
|---------|----------------|----------------------|-------------------------|-------------------------------------------------------------------------|
| COMPONE | NTS:           |                      |                         | ORIGINAL MEASUREMENIS:                                                  |
| (1) He  | lium; H        | e; 7440-59-7         |                         | Schindler, D. L., Swift, G. W. and<br>Kurata, F., Hydrocarbon Process., |
| (2) Pr  | opane;         | C₃H₀; 74-98-6        |                         | <u>1966</u> , 45, no. 11, 205.                                          |
|         |                |                      |                         |                                                                         |
|         |                |                      |                         |                                                                         |
| EXPERIM | ENTAL V        | ALUES:               |                         |                                                                         |
|         |                | Mole fraction        | of helium               | n                                                                       |
| Т/К     | <i>P/</i> bar  | in liquid, $x_{m_1}$ | in gas,<br><sup>y</sup> |                                                                         |
|         |                | Не                   | • He                    |                                                                         |
| 198.15  | 124.1          | 0.0092               | 0.9978                  |                                                                         |
|         | 179.3          | 0.0110               | 0.9982                  |                                                                         |
| 173.15  | 206.8<br>13.79 | 0.0143<br>0.00064    | 0.9984<br>0.9972        |                                                                         |
|         | 41.37          | 0.0019               | 0.9986                  |                                                                         |
|         | 96.53          | 0.0042               | 0.99937                 |                                                                         |
|         | 124.1<br>151.7 | 0.0052               | 0.99940<br>0.99947      |                                                                         |
|         | 179.3<br>206.8 | 0.0072               | 0.99960<br>0.99980      |                                                                         |
| 123.15  | 13.79          | 0.00012              | -                       |                                                                         |
|         | 68.95          | 0.00052              | -                       |                                                                         |
|         | 96.95<br>124.1 | 0.00070              | -                       |                                                                         |
|         | 151.7<br>179.3 | 0.0010<br>0.0012     | -                       |                                                                         |
|         | 206.8          | 0.0014               | -                       |                                                                         |
|         |                |                      |                         |                                                                         |
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|         |                |                      |                         |                                                                         |
|         |                |                      |                         |                                                                         |

|        |              |                                     |                 |              |                     |                           | ·······            |
|--------|--------------|-------------------------------------|-----------------|--------------|---------------------|---------------------------|--------------------|
| COMP   | DNENTS:      |                                     |                 | ORIGI        | NAL MEASUREN        | ÆNTS:                     |                    |
| 1.     | Helium:      | He: 7440-59-7                       |                 | Tsik         | lis. D. S.          | . Maslennikova            | . V. Ya.           |
|        | •            |                                     |                 |              | Commence            | N D 7hum                  | Ri a               |
| 2.     | Methane,     | dichlorodifluor                     | o <b>-;</b>     | and          | Goryunova           | , N. P., 2nur.            | <i>c 1 2</i> .     |
|        | CC1          | F . 75_71 0                         |                 | Chem         | ., <u>1967</u> , 4  | 41, 1804.                 |                    |
|        |              | r <sub>2</sub> ; /J=/1=0            |                 |              |                     |                           |                    |
|        |              |                                     |                 |              |                     |                           |                    |
| VADT   | ABLES        |                                     |                 | DDDDA        |                     | ·····                     |                    |
| VANL   | RDDLD.       |                                     |                 | PREPA        | RED BI:             |                           |                    |
| Tem    | perature,    | pressure                            |                 | с. г         | • Young             |                           |                    |
|        |              |                                     |                 |              |                     |                           |                    |
| EXPE   | RIMENTAL VAL | UES:                                |                 |              | ·····               |                           |                    |
|        |              | Nolo fraction                       | of holium       |              |                     | Nole fraction             | ofholium           |
| т/к    | P/bar        | in lower                            | in upper        | ፹/κ          | P/bar               | in lower                  | in upper           |
| -,     | -,           | phase,                              | phase,          | -,           | -,                  | phase,                    | phase,             |
|        |              | x <sub>He</sub>                     | y <sub>He</sub> |              |                     | x <sub>He</sub>           | y <sub>He</sub>    |
|        |              |                                     |                 |              |                     |                           |                    |
| 298    | 57           | -                                   | 0.85            | 388          | 79                  | 0.075                     | 0.24               |
|        | 126          | 0.05                                | -               |              | 81                  | -                         | 0.243              |
|        | 134          | -                                   | 0.934           |              | 93                  | _<br>0 106                | 0.275              |
|        | 228          | 0.09                                | -               |              | 101                 | -                         | 0.30               |
| 323    | 60           | -                                   | 0.73            |              | 122                 | 0.150                     | -                  |
|        | 126          | 0.06                                | -               |              | 126                 | -                         | 0.408              |
|        | 233          | 0 11                                | 0.865           |              | 135                 | -<br>0 166                | 0.435              |
|        | 238          | -                                   | 0.92            |              | 144                 | 0.135                     | _                  |
| 348    | 64           | -                                   | 0.619           |              | 155                 | 0.192                     | -                  |
|        | 132          | 0.12                                | -               |              | 158                 | -                         | 0.49               |
|        | 241          | 0 16                                | 0.776           |              | 167<br>173          | 0.283                     | -                  |
|        | 244          | -                                   | 0.857           |              | 181                 | 0.22                      | -                  |
|        | 247          | -                                   | 0.860           |              | 188                 | -                         | 0.55               |
| 373    | 74           | -                                   | 0.413           |              | 213                 | 0.258                     | -                  |
|        | 143          | 0.13                                | -               |              | 221                 | - 258                     | 0.59               |
|        | 199          | -                                   | 0.70            |              | 251                 | -                         | 0.667              |
|        | 245          | 0.212                               | -               | 391          | 110                 | 0.308                     | -                  |
| 200    | 251          | -                                   |                 |              | 111                 | -                         | 0.312              |
| 388    | 6⊥<br>71     | -                                   | 0.155           |              | 120                 | -                         | 0.17               |
|        | , -          |                                     | 0.171           |              | 120                 | 0.10                      |                    |
|        |              |                                     | AUXILIARY       | INFORM       | <b>IATION</b>       |                           |                    |
| METH   | OD/APPARATI  | JS/PROCEDURE :                      |                 | SOURC        | E AND PURITY        | OF MATERIALS:             |                    |
| D = -1 | ing subsel   |                                     |                 | <b> </b> , , |                     | ton then 00 7 -           |                    |
| ROCK   | n as refer   | lave apparatus.<br>Sence in which a | ReI. I          | 1.           | Purity Det<br>Cent. | ter than 99.7 m           | loie per           |
| is d   | escribed.    | It is not cle                       | ar which        | ļ            |                     |                           |                    |
| of t   | he several   | . apparatus desc                    | ribed           | 2. 1         | Fechnical           | grade.                    |                    |
| were   | used.        |                                     |                 |              |                     |                           |                    |
|        |              |                                     |                 | [            |                     |                           |                    |
|        |              |                                     |                 |              |                     |                           |                    |
|        |              |                                     |                 | Í            |                     |                           |                    |
|        |              |                                     |                 |              |                     |                           |                    |
|        |              |                                     |                 |              |                     |                           | -                  |
|        |              |                                     |                 | ESTIM        | ATED ERROR:         |                           |                    |
|        |              |                                     |                 | δт/К         | = ±0.5;             | $\delta P/bar = \pm 1.0;$ | δx <sub>Hρ</sub> , |
|        |              |                                     |                 | δυ           | $= \pm 0.01$ (      | estimated by co           | mpiler).           |
|        |              |                                     |                 | чне          |                     |                           |                    |
|        |              |                                     |                 | הםםםם        | FNCFC.              |                           |                    |
|        |              |                                     |                 | REFER        |                     |                           | _                  |
|        |              |                                     |                 | 1. 1         | 'siklis, D          | . S., Technique           | s of               |
|        |              |                                     |                 | I            | Physicoche          | mical Experimen           | t at               |
|        |              |                                     |                 | H            | ligh and U          | ltrahigh Pressu           | res,               |
|        |              |                                     |                 | 1            | sd. Khimi           | <i>ча, Мовсо</i> w. 196   | 5.                 |
|        |              |                                     |                 |              |                     |                           | -                  |
|        |              |                                     |                 | 1            |                     |                           |                    |

|      |                                                                            |                                                        |                                                      | - Management of the local division of the                                  |                                               |                                                      |                                                       |  |
|------|----------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------|-------------------------------------------------------|--|
| COMP | PONENTS:                                                                   |                                                        |                                                      | ORIGINAL MEASUREMENTS:                                                     |                                               |                                                      |                                                       |  |
| (1)  | (1) Helium; He; 7440-59-7                                                  |                                                        |                                                      |                                                                            | lis, D. S                                     | ., Maslenniko                                        | ova, V. Ya.                                           |  |
| (2)  | ) Methane; dichlorodifluoro-;<br>CCL <sub>2</sub> F <sub>2</sub> ; 75-71-8 |                                                        |                                                      | and Goryunova, N. P., 2 <i>nur. Fiz.</i><br>Chem., <u>1967</u> , 41, 1804. |                                               |                                                      |                                                       |  |
|      |                                                                            |                                                        |                                                      |                                                                            |                                               |                                                      |                                                       |  |
| EXPE | RIMENTAL V                                                                 | JALUES:                                                |                                                      |                                                                            |                                               |                                                      |                                                       |  |
| т/к  | P/bar                                                                      | Mole fractior<br>in lower<br>phase,<br><sup>x</sup> He | ı of helium<br>in upper<br>phase,<br><sup>y</sup> He | т/К                                                                        | P/bar                                         | Mole fracti<br>in lower<br>phase,<br><sup>x</sup> He | on of helium<br>in upper<br>phase,<br><sup>y</sup> He |  |
|      |                                                                            |                                                        |                                                      |                                                                            |                                               |                                                      |                                                       |  |
| 391  | 122<br>135<br>150<br>160<br>197<br>203<br>220<br>223                       | -<br>0.23<br>0.26<br>0.29<br>0.307                     | 0.36<br>0.37<br>-<br>0.515<br>0.563                  | 391<br>395                                                                 | 235<br>240<br>279<br>286<br>316<br>321<br>333 | 0.323<br>0.645<br>0.562<br>0.464                     | 0.57<br>0.615<br>0.566<br>0.684                       |  |

| COMPONENTS:                                           | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                  |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| l. Helium; He; 7440-59-7                              | Heise, F., Ber. Bunsenges. Phys.                                                                                                                                                                                                                        |
| 2. Ammonia: NH: 7664-41-7                             | Chem., <u>1972</u> , 76, 936.                                                                                                                                                                                                                           |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
| VADIABIES.                                            |                                                                                                                                                                                                                                                         |
| VARIABLES:                                            | PREPARED BY:                                                                                                                                                                                                                                            |
| Temperature, pressure                                 | C. L. Young                                                                                                                                                                                                                                             |
| EVDEDIMENTAL VALUES.                                  |                                                                                                                                                                                                                                                         |
| Mole fraction of helium                               | L Contraction of the second                                                                                                                                         |
| T/K P/bar in liquid, in vapor,                        |                                                                                                                                                                                                                                                         |
| "He <sup>9</sup> He                                   |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
| 104.25 - 0.8900                                       |                                                                                                                                                                                                                                                         |
| 194.35 0.00528 0.9358<br>313 15 210 05 0.00701 0.9031 |                                                                                                                                                                                                                                                         |
| 515.15 210.05 0.00701 0.9051                          |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
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|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
| AUXILIARY                                             | INFORMATION                                                                                                                                                                                                                                             |
| METHOD /APPARATUS/PROCEDURE:                          | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                                         |
| Static rocking equilibrium cell;                      | 1. Messer-Griessheim sample, purity                                                                                                                                                                                                                     |
| liquid and gas samples removed after                  | better than 99.95 mole per cent.                                                                                                                                                                                                                        |
| analysed by freezing out ammonia in                   | 2. Gerling and Holtz sample, purity                                                                                                                                                                                                                     |
| liquid nitrogen trap. Details in                      | as determined by gas chromato-                                                                                                                                                                                                                          |
| source and ref. 1.                                    | graphy and mass spectrometry.                                                                                                                                                                                                                           |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       |                                                                                                                                                                                                                                                         |
|                                                       | ESTIMATED ERROR:                                                                                                                                                                                                                                        |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$                                                                                                                                                                  |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$<br>bar; $\pm 0.6$ above 100 bar; $\delta x_{He} = \pm 2$ %                                                                                                       |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$<br>bar; $\pm 0.6$ above 100 bar; $\delta x_{He} = \pm 2$ %<br>(estimated by compiler).                                                                           |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$<br>bar; $\pm 0.6$ above 100 bar; $\delta x_{He} = \pm 2$ %<br>(estimated by compiler).<br>REFERENCES:                                                            |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$<br>bar; $\pm 0.6$ above 100 bar; $\delta x_{He} = \pm 2\%$<br>(estimated by compiler).<br>REFERENCES:<br>1. Heise, F., Dissertation,<br>Cöttingon 1971           |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$<br>bar; $\pm 0.6$ above 100 bar; $\delta x_{He} = \pm 2$ %<br>(estimated by compiler).<br>REFERENCES:<br>1. Heise, F., Dissertation,<br>Göttingen, <u>1971</u> . |
|                                                       | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$<br>bar; $\pm 0.6$ above 100 bar; $\delta x_{He} = \pm 2$ %<br>(estimated by compiler).<br>REFERENCES:<br>1. Heise, F., Dissertation,<br>Göttingen, <u>1971</u> . |

| COMPONENTS :                                        | EVALUATOR:                                                                                                  |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 1. Helium; He; 7440-59-7<br>2. Argon; Ar; 7440-37-1 | Colin Young,<br>School of Chemistry,<br>University of Melbourne,<br>Parkville, Victoria 3052,<br>AUSTRALIA. |

CRITICAL EVALUATION:

There are seven sets of high pressure measurements on this system. The three sets of data by Streett and coworkers (1,2,3) are mutually consistent but cover different pressure ranges. The two sets of data by Skripka and coworkers (4,5) are in fair agreement but the later data by Skripka and Lobonova (5) are thought to be more reliable. There is good agreement between the data of Mullins and Ziegler (6), Sinor and Kurata (7) and Streett (1). Hence the data of Mullins and Ziegler (6), Sinor and Kurata (7), Streett (1), Streett and Erickson (2), Streett and Hill (3) are all classified as tentative. The solubility data of Skripka and Lobonova (5) are marginally higher than that of Streett (1) and are classified as doubtful as are the earlier data of Skripka and Dykhno (4).

## References

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- 2. Streett, W. B. and Erickson, A., Physics Earth Planetary Interiors, 1972, 5, 357.
- 3. Streett, W. B. and Hill, J. L. E., Trans. Faraday Soc., 1971, 67, 622.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., <u>1964</u>, no. 8, 63.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no. 13, 90.
- Mullins, J. C. and Ziegler, W. T., Int. Adv. Cryog. Engng., <u>1964</u>, 10, 171.
- 7. Sinor, J. E. and Kurata, F., J. Chem. Engng. Data, 1966, 11, 537

|            |                           |                             |                             | ·••                                 |                           |                         |                                     |
|------------|---------------------------|-----------------------------|-----------------------------|-------------------------------------|---------------------------|-------------------------|-------------------------------------|
| COMPONENT  | :S :                      |                             |                             | ORIGINAL MEASUREMENTS:              |                           |                         |                                     |
| (l) He     | lium;                     | He; 7440-59-7               |                             | Streett, W. B. and Erickson, A. L., |                           |                         |                                     |
| (2) Ar     | gon; A                    | Ar; 7440-37-1               |                             | Physics<br>1972, 5                  | Eartn<br>, 357.           | Planetary Int           | eriors,                             |
|            | <b>-</b>                  |                             |                             |                                     | •                         |                         |                                     |
|            |                           |                             |                             | }                                   |                           |                         |                                     |
| VARIABLES  | S:                        |                             |                             | PREPARED                            | BY:                       |                         |                                     |
| Tompora    | ±umo n                    |                             |                             |                                     | '                         |                         |                                     |
| Tempera    | ture, p                   | ressure                     |                             | С. Ц. 1                             | oung                      |                         |                                     |
| EXPERIMEN  | TAL VALU                  | JES:                        | <b>c b</b> - <b>1 d u m</b> |                                     |                           |                         | c 1 1 d                             |
| т/к        | <i>P/</i> bar             | Mole fraction<br>in liquid, | of nellum<br>in vapor,      | т/к                                 | P/bar                     | in liquid,              | of nellum<br>in vapor,              |
|            | ·                         | <sup>x</sup> He             | <sup>y</sup> <sub>He</sub>  | ·                                   | ·                         | <sup>x</sup> He         | <sup>y</sup> <sub>He</sub>          |
| 150.02     | 3860                      | 0.2941                      | 0.9353                      | 180.00                              | 5796                      | 0.6217                  | 0.7835                              |
|            | 4274                      | 0.2825                      | 0.9435                      |                                     | 5935<br>5996              | 0.6002                  | 0.7991                              |
|            | 4683 <sup>a</sup>         | 0.270                       | 0.949                       |                                     | 6072                      | 0.5731                  | 0.8207                              |
| 159.90     | 3515                      | 0.4240                      | 0.8721                      |                                     | 6293                      | 0.5419                  | 0.8419                              |
|            | 4001                      | 0.3904                      | 0.8972                      |                                     | 6555<br>7031              | 0.5143                  | 0.8603                              |
|            | 4963                      | 0.3429                      | 0.9256                      |                                     | 7516                      | 0.4483                  | 0.8983                              |
|            | 5386                      | 0.3272                      | 0.9342                      |                                     | 7968                      | 0.4265                  | 0.9079                              |
|            | 5645<br>5666a             | 0.3191                      | 0.9384                      | 100 00                              | 8010 <sup>th</sup>        | 0.424                   | 0.910                               |
| 170.00     | 5666<br>4067 <sup>b</sup> | 0.31/<br>0.682              | 0.939                       | 190.00                              | 7830<br>7937              | U./15<br>0.6346         | U./15<br>0.7989                     |
| 1/0.00     | 4102                      | 0.6114                      | -                           |                                     | 8003                      | 0.6193                  | 0.8086                              |
|            | 4142                      | 0.5893                      | 0.7737                      |                                     | 8079                      | 0.6042                  | 0.8210                              |
|            | 4205                      | 0.5672                      | 0.7958                      |                                     | 8143<br>9357              | 0.5949                  | 0.8280                              |
|            | 4419                      | 0.5301                      | 0.8262                      |                                     | 8678                      | 0.4265                  | 0.8605                              |
|            | 4625                      | 0.5020                      | 0.8470                      |                                     | 9002                      | 0.5167                  | 0.8762                              |
|            | 4963                      | 0.4695                      | 0.8689                      |                                     | 9264                      | 0.5033                  | 0.8821                              |
|            | 5452                      | 0.4324                      | 0.8921<br>0.9079            | 193.00                              | 9312<br>8514 <sup>b</sup> | 0.500                   | 0.883<br>0 719                      |
|            | 6197                      | 0.3947                      | 0.9171                      | T) ] • 00                           | 8657                      | 0.6259                  | 0.8073                              |
|            | 6638                      | 0.3760                      | 0.9261                      |                                     | 8685                      | 0.6124                  | 0.8182                              |
| 100 00     | 6817<br>5004b             | 0.368                       | 0.930                       |                                     | 8726                      | -<br>0 5027             | 0.8264                              |
| 100.00     | 5004                      | 0.702                       | 0.702                       | <u> </u>                            | 0010                      | 0.3927                  | 0.0310                              |
|            |                           |                             | AUXILIARY                   | INFORMATIO                          | ON                        |                         |                                     |
| METHOD / 7 | APPARATI                  | US/PROCEDURE:               |                             | SOURCE AN                           | D PURITY                  | OF MATERIALS:           |                                     |
| Recircul   | lating v                  | vapor flow app              | paratus                     | No details given.                   |                           |                         |                                     |
| with mag   | jnetic p                  | pump. Temper                | rature                      |                                     |                           | -                       |                                     |
| measured   | l with p                  | platinum resis              | stance                      |                                     |                           |                         |                                     |
| manganir   | eter.                     | Pressure meas               | Samples                     |                                     |                           |                         |                                     |
| of liqui   | id and o                  | gas analysed t              | by thermal                  |                                     |                           |                         |                                     |
| conducti   | vity.                     | Details in s                | source.                     | Í                                   |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             | ESTIMATED                           | ) ERROR:                  |                         |                                     |
|            |                           |                             |                             | $\delta T/K = \pm$                  | ±0.01;                    | $\delta P/bar = \pm 5;$ | δx <sub>He</sub> , δy <sub>He</sub> |
|            |                           |                             |                             | = ±1 mol                            | e perce                   | nt (estimated           | by                                  |
|            |                           |                             |                             | compiler                            | c).                       |                         |                                     |
|            |                           |                             |                             | REFERENCE                           | ES:                       |                         | <u> </u>                            |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |
|            |                           |                             |                             |                                     |                           |                         |                                     |

| COMPONE            | ENTS:                      |                |                 | ORIGINAL MEASUREMENTS:                           |
|--------------------|----------------------------|----------------|-----------------|--------------------------------------------------|
| (1) Hel            | Lium; He                   | ; 7440-59-7    |                 | Streett, W. B. and Erickson, A. L.,              |
| (2) Arc            | ion: Ar                    | : 7440-37-1    |                 | Physics Earth Planetary Interiors, 1972, 5, 357. |
| (2)                | ,,                         | ,              |                 |                                                  |
|                    |                            |                |                 |                                                  |
| EXPERIM            | ENTAL V                    | ALUES:         |                 |                                                  |
|                    |                            | Mole fraction  | of helium       |                                                  |
| т/к                | <i>P/</i> bar              | in liquid,     | in vapor,       |                                                  |
|                    |                            | "Не            | <sup>9</sup> He |                                                  |
| 193.00             | 8967                       | 0.5712         | 0.8461          |                                                  |
|                    | 9250<br>9567               | 0.5432         | 0.8627          |                                                  |
|                    | 9670 <sup>a</sup>          | 0.520          | 0.878           |                                                  |
| 195.00             | 8974 <sup>D</sup>          | 0.722          | 0.722           |                                                  |
|                    | 9151<br>9181               | 0.6026         | 0.8250          |                                                  |
|                    | 9216                       | 0.5975         | 0.8317          |                                                  |
|                    | 9260                       | 0.5951         | 0.8344          |                                                  |
|                    | 9505                       | 0.5622         | 0.8442          |                                                  |
|                    | 9884                       | 0.5347         | 0.8706          |                                                  |
| 197.00             | 9940~<br>9360 <sup>b</sup> | 0.550          | 0.872           |                                                  |
| 177700             | 9519                       | 0.6204         | 0.8160          |                                                  |
|                    | 9554                       | 0.6160         | 0.8210          |                                                  |
|                    | 9636                       | 0.6034         | 0.8289          |                                                  |
|                    | 9784                       | 0.5860         | 0.8416          |                                                  |
|                    | 9981<br>10153              | 0.5667         | 0.8522          |                                                  |
|                    | 10204 <sup>a</sup>         | 0.560          | 0.862           |                                                  |
| 199.00             | 9761~<br>9843              | 0.724          | 0.724           |                                                  |
|                    | 9870                       | 0.6432         | 0.8020          |                                                  |
|                    | 9894                       | 0.6368         | 0.8077          |                                                  |
|                    | 9933<br>10022              | 0.6289         | 0.8120          |                                                  |
|                    | 10043                      | 0.6056         | 0.8244          |                                                  |
|                    | 10160                      | 0.5941         | 0.8335          |                                                  |
|                    | 10408a                     | 0.560          | 0.8512          |                                                  |
|                    |                            |                |                 | -                                                |
| <sup>a</sup> Three | phase p                    | ressure ± 10 b | ar              |                                                  |
| b                  |                            |                |                 | -                                                |
| ~ Criti            | cal pres                   | sure ± 20 bar  |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |
|                    |                            |                |                 |                                                  |

| COMBONI  | CNTC .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |                 | ODTOTIVAL NO                      | A CUD ENENI     | 20 -                          |                      |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|-----------------------------------|-----------------|-------------------------------|----------------------|
| COMPONE  | EN15:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |                 | ORIGINAL ME                       | ASUREMENT       | .5:                           |                      |
| (1)      | Helium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ; He; 7440-59         | -7              | Mullins,                          | J. C. a         | and Ziegler,                  | W. T.,               |
| (2)      | Argon:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Ar: $7440 - 37$       | -1              | 10, 171,                          | . Aav. (        | Cryogenic En                  | igng., <u>1964</u> , |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | , ,                   | -               |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
| VARIAB   | LES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                 | PREPARED BY                       | · •             |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   | •               |                               |                      |
| Temp     | perature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | , pressure            |                 | C. L. Yo                          | ung             |                               |                      |
| <u> </u> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
| EXPERI   | MENTAL VAI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | WES:<br>Mole fraction | of belium       |                                   |                 | Mole frac                     | tion of              |
| т/к      | <i>P/</i> bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | in liquid,            | in vapor,       | т/к                               | <i>P/</i> bar   | in liquid,                    | in vapor,            |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | x <sub>He</sub>       | <sup>y</sup> He |                                   |                 | x <sub>He</sub>               | <sup>y</sup> He      |
| I        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
| 91.99    | 81.26                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.97053         | 108.04                            | 60.80           | -                             | 0.8710               |
| 91.99    | 61.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.96384         | 91.99                             | 81.26           | 0.00756                       | -                    |
| 91.95    | 20.18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.9496          | 92.00                             | 40.67           | 0.00387                       | _                    |
| 91.96    | 121.39                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.97748         | 91.96                             | 20.18           | 0.00192                       | -                    |
| 91.98    | 101.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.97465         | 91.97                             | 121.39          | 0.01071                       | -                    |
| 97.50    | 121.66                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.96417         | 91.96                             | 101.60          | 0.00917                       | -                    |
| 97.51    | 81.06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.9530          | 97.51                             | 101.40          | 0.01212                       | _                    |
| 97.51    | 61.05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.9412          | 97.50                             | 81.06           | 0.00985                       | -                    |
| 97.51    | 40.57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.9179          | 97.52                             | 61.00           | 0.00756                       | -                    |
| 97.52    | 20.29                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.8522          | 97.51                             | 40.67           | 0.00499                       | -                    |
| 86.02    | 81.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.98351         | 97.51                             | 61.00           | 0.00748                       | -                    |
| 86.02    | 61.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.97989         | 86.02                             | 81.20           | 0.00550                       | -                    |
| 86.03    | 40.04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.97195         | 86.02                             | 61.07           | 0.00418                       | -                    |
| 86.02    | 20.21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.95020         | 86.03                             | 40.04           | 0.00283                       | _                    |
| 86.01    | 121.82                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.98724         | 86.00                             | 20.23           | 0.00143                       |                      |
| 86.00    | 101.71                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.98573         | 86.01                             | 101.74          | 0.00675                       | -                    |
| 86.00    | 121.59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.98705         | 108.02                            | 121.66          | 0.02216                       | -                    |
| 86.02    | 121.59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.98/2/         | 108.03                            | 101.40<br>81 06 | 0.018/9                       | -                    |
| 108.01   | 101.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                     | 0.9123          | 108.04                            | 60.80           | 0.01145                       | -                    |
| 108.04   | 81.06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                     | 0.8966          |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       | AUXILIARY       | INFORMATION                       |                 |                               |                      |
| METHOD   | /APPARA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TUS/PROCEDURE:        |                 | SOURCE AND                        | PURTTY OF       | MATERIALS.                    |                      |
| Singl    | e pass f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | low apparatus         | Т₩О             | 1 and 2                           | · Purit         | ies better                    | than                 |
| compa    | irtment e                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | equilibrium cel       | ll. Tem-        | 99.995                            | mole per        | cent.                         | Linum                |
| perat    | ure meas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | sured with plat       | inum            |                                   |                 |                               |                      |
| resis    | stance the | ermometer; pi         | ressure         |                                   |                 |                               |                      |
| heliu    | m bubble                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ed through liqu       | id argon.       |                                   |                 |                               |                      |
| Sampl    | es analy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ysed by gas chi       | comato-         |                                   |                 |                               |                      |
| graph    | ıy. Det                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ails in source        | e.              |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 | ESTIMATED H                       | ERROR:          |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 | $\delta T/K = $                   | ±0.03;          | $\delta P/\text{bar} = \pm 0$ | .5%;                 |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 | $^{\circ x}$ He $\stackrel{<}{-}$ | 128; 0(         | $1-y_{\text{He}} = 13$        | ₹.                   |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 | REFERENCES                        | :               |                               |                      |
| 1        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
| ļ        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
| 1        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
| 1        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                 |                                   |                 |                               |                      |

| COMPONENTS:                            | ORIGINAL MEASUREMENTS:                                     |
|----------------------------------------|------------------------------------------------------------|
| (1) Helium; He; 7440-59-7              | Sinor, J. E. and Kurata, F., J. Chem.                      |
| (2) Argon; Ar; 7440-37-1               | 2.19. 2000, <u>1300</u> , 11, 337.                         |
|                                        |                                                            |
|                                        |                                                            |
|                                        |                                                            |
| VARIABLES:                             | PREPARED BY:                                               |
|                                        |                                                            |
| Temperature, pressure                  | C. L. Young                                                |
|                                        |                                                            |
| EXPERIMENTAL VALUES:                   |                                                            |
| T/K P/bar Mole fraction of             | helium in liquid, <sup>x</sup> He                          |
| 93.15 17.2                             | 0.0015                                                     |
| 34.5                                   | 0.0035                                                     |
| 68.95                                  | 0.0071                                                     |
| 86.18                                  | 0.0087                                                     |
| 103.4                                  | 0.0102                                                     |
|                                        | 0.0114                                                     |
|                                        | 0.0129                                                     |
| 34.5                                   | 0.0075                                                     |
| 51.7                                   | 0.0119                                                     |
| 68.95                                  | 0.0164                                                     |
|                                        | 0.0210                                                     |
| 120.7                                  | 0.0287                                                     |
| 137.9                                  | 0.0325                                                     |
| 133.15 34.5                            | 0.0068                                                     |
| 51./<br>68.95                          | 0.0276                                                     |
| 86.18                                  | 0.0370                                                     |
| 103.4                                  | 0.0461                                                     |
| 120.7                                  | 0.0549                                                     |
|                                        | 0.0121                                                     |
| 68.95                                  | 0.0393                                                     |
| 86.18                                  | 0.0650                                                     |
| 103.4                                  | 0.0895                                                     |
| 137.9                                  | 0.1380                                                     |
|                                        |                                                            |
| AUXILIARY                              | CONDER AND DUDITY OF MATERIALS.                            |
| MEINOD /APPARATUS/PROCEDURE:           | SOURCE AND FURITI OF MATERIALS:                            |
| Static equilibrium cell (0.1 & capa-   | 1. U.S. Bureau of Mines sample maxi-                       |
| City) fitted with magnetic stirrer.    | mum impurity 12 parts per million.                         |
| resistance thermometer. Pressure       | mole per cent.                                             |
| measured with Bourdon gauge. Contents  | L                                                          |
| charged into cell, equilibrated liquid |                                                            |
| samples withdrawn and analysed by G.C. |                                                            |
| becarrs in source and rer, r.          |                                                            |
|                                        |                                                            |
|                                        |                                                            |
|                                        | ESTIMATED ERROR.                                           |
|                                        | $\delta \pi / K = \pm 0.02$ , $\delta P / har = \pm 0.1$ . |
|                                        | $\delta x_{} = \pm 1$ or $\pm 0.0003$ (whichever is        |
|                                        | He greater)                                                |
|                                        |                                                            |
|                                        | REFERENCES:                                                |
|                                        | 1. Sinor, J. E., Schindler, D. L. and                      |
|                                        | Kurata, F., Am. Inst. Chem. Engnrs<br>J 1966 19 353        |
|                                        | <i>••••</i> , <u>1900</u> , 12, 333.                       |
|                                        |                                                            |
|                                        |                                                            |
|                                        |                                                            |

| COMPONEN                  | TS:          |                       |                                        | ORIGINAL            | MEASUREN       | ENTS:                                                      |                      |
|---------------------------|--------------|-----------------------|----------------------------------------|---------------------|----------------|------------------------------------------------------------|----------------------|
| (1) Helium; He; 7440-59-7 |              |                       | Streett, W. B., Trans. Faraday         |                     |                |                                                            |                      |
| (2)                       | Argon;       | Ar; 7440-37           | -1                                     | 500.,               | 1969,          | 00, 090.                                                   |                      |
|                           |              |                       |                                        |                     |                |                                                            |                      |
| 1                         |              |                       |                                        |                     |                |                                                            |                      |
| VARIABLE                  | :S:          |                       | ······································ | PREPARED            | BY:            | <u> </u>                                                   |                      |
| Tempe                     | rature,      | pressure              |                                        | с. г.               | Young          |                                                            |                      |
|                           |              |                       |                                        |                     |                |                                                            | }                    |
| EXPERIME                  | NTAL VAL     | UES:<br>Mole fractio  | n of helium                            |                     |                | Mole fract                                                 | ion of helium        |
| т/к                       | P/bar        | in liquid,            | in vapor,                              | т/к                 | P/bar          | in liquid,                                                 | in vapor,            |
| 01.24                     | 14.0         | <sup>x</sup> He       | <sup>y</sup> He                        | 144 4               | 554 6          | <sup>x</sup> He                                            | <sup>y</sup> He      |
| 91.34                     | 14.2<br>41.3 | 0.0015                | 0.8812                                 | 144.4               | 554.6<br>620.3 | 0.2984                                                     | 0.7192               |
| 1                         | 68.6         | 0.0065                | 0.9666                                 |                     | 628.9          | 0.3127                                                     | -                    |
|                           | 133.0        | 0.0118                | 0.9765                                 | 145 07              | 687.2          | 0.3188                                                     | -                    |
| 1                         | 273.6        | 0.0196                | 0.9861                                 | 143.97              | 308.1          | 0.2596                                                     | 0.5525               |
|                           | 316.3        | 0.0216                | 0.9905                                 |                     | 386.0          | 0.2994                                                     | 0.6023               |
|                           | 366.0        | 0.0237                | 0.9924                                 |                     | 450.8          | 0.3207                                                     | 0.6261               |
| 130.08                    | 32.5         | 0.0067                | 0.2716                                 |                     | 548.0          | 0.3584                                                     | 0.6600               |
| ļ                         | 97.2         | 0.0380                | 0.5200                                 | 146.90              | 257.5          | 0.2556                                                     | 0.4897               |
| 1                         | 141.3        | 0.0548                | 0.7480                                 |                     | 288.8          | 0.2783                                                     | 0.5086               |
|                           | 199.5        | 0.0794                | 0.7967                                 |                     | 317.0          | 0.3007                                                     | 0.5187               |
| 1                         | 279.2        | 0.1032                | 0.8329                                 |                     | 323.2          | 0.3049                                                     | 0.5240               |
|                           | 418.4        | 0.1348                | 0.8670                                 |                     | 412.9          | 0.3652                                                     | 0.5543               |
|                           | 484.9        | 0.1454                | 0.8779                                 |                     | 448.1          | 0.3754                                                     | 0.5551               |
| Ì                         | 554.1        | 0.1526                | 0.8864                                 |                     | 486.7          | 0.3822                                                     | 0.5862               |
|                           | 619.3        | 0.1603                | 0.9013                                 |                     | 536.9          | 0.3987                                                     | 0.6039               |
| 144.4                     | 68.7         | 0.0328                | 0.3058                                 |                     | 689.3          | 0.4111                                                     | 0.6655               |
|                           | 134.1        | 0.0967                | 0.4631                                 | 147.73              | 98.9           | 0.0838                                                     | 0.2581               |
|                           | 204.4        | 0.1570                | 0.5551                                 |                     | 143.4          | 0.1528                                                     | 0.3466               |
|                           | 2/3.5        | 0.1999                | 0.61/8                                 |                     | 1/2.4<br>239 2 | 0.1818                                                     | 0.3853               |
|                           | 422.5        | 0.2669                | 0.6820                                 |                     | 262.9          | 0.3678                                                     | 0.3873               |
|                           | 486.7        | 0.2862                | 0.7020                                 |                     |                |                                                            |                      |
|                           |              |                       | AUXILIARY                              | INFORMATIO          | DN             |                                                            |                      |
| METHOD/F                  | PPARATU      | IS/PROCEDURE:         |                                        | SOURCE AN           | D PURITY       | OF MATERIALS                                               | :                    |
| Recircu                   | lating       | vapor flow ap         | pparatus.                              | No deta             | ils giv        | en.                                                        |                      |
| Details                   | of app       | aratus given          | in ref. 1.                             |                     |                |                                                            |                      |
| Tempera                   | nce the      | asured with prmometer | Platinum                               |                     |                |                                                            |                      |
| measure                   | d with       | Bourdon gauge         | e. Samples                             |                     |                |                                                            |                      |
| of coex                   | isting       | phases analys         | sed by                                 |                     |                |                                                            |                      |
| thermal                   | conduc       | tivity.               |                                        |                     |                |                                                            |                      |
|                           |              |                       |                                        |                     |                |                                                            |                      |
| ]                         |              |                       |                                        |                     |                |                                                            |                      |
|                           |              |                       |                                        |                     |                |                                                            |                      |
|                           |              |                       |                                        | FOTMATED            | FDDOD          | ······                                                     | <u>_</u>             |
|                           |              |                       |                                        | LOIIMAILD           | ERROR:         | $\delta P/har = +$                                         | 0 1.                 |
|                           |              |                       |                                        | $\delta x_{} = \pm$ | ±0.0002        | $\delta u_{1,1} = \pm \delta u_{1,1} = \pm \delta u_{1,1}$ | 0.001                |
|                           |              |                       |                                        | He<br>(estimat      | ted by         | сотрiler).                                                 |                      |
|                           |              |                       |                                        | REFERENCE           | -<br>S:        | -                                                          |                      |
|                           |              |                       |                                        | 1. Stre             | eett, W        | . B., Cryog                                                | enics, <u>1965</u> , |
|                           |              |                       |                                        | 5,2                 | 27.            |                                                            | _                    |
|                           |              |                       |                                        |                     |                |                                                            |                      |
|                           |              |                       |                                        |                     |                |                                                            |                      |
|                           |              |                       |                                        |                     |                |                                                            |                      |

| COMPONENTS                                                                      | 5:                                                                                |                                                                                                                  | ORIGINAL MEASUREMENTS:                                                                                                        |                                       |  |  |  |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--|--|--|
| (1) He                                                                          | lium; He;                                                                         | 7440-59-7                                                                                                        | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.                                                           |                                       |  |  |  |
| (2) AI                                                                          | gon; Ar;                                                                          | /440-3/-I                                                                                                        | Kriog. Mashinstr., 19                                                                                                         | 04, 0, 103.                           |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  |                                                                                                                               |                                       |  |  |  |
| VARIABLES                                                                       | :                                                                                 |                                                                                                                  | PREPARED BY:                                                                                                                  |                                       |  |  |  |
| Tomport                                                                         | tura prod                                                                         |                                                                                                                  | C I Young                                                                                                                     |                                       |  |  |  |
| Tempera                                                                         | cure, press                                                                       | Sure                                                                                                             | C. D. Houng                                                                                                                   |                                       |  |  |  |
| EXPERIMEN                                                                       | TAL VALUES:                                                                       |                                                                                                                  |                                                                                                                               |                                       |  |  |  |
|                                                                                 | <b>n</b> (1                                                                       | <b>5+</b> 4                                                                                                      | Mole fraction of                                                                                                              | helium                                |  |  |  |
| Т/К                                                                             | <i>P/bar</i>                                                                      | P /bar                                                                                                           | in liquid, <sup>x</sup> He                                                                                                    | in vapor, <sup>y</sup> He             |  |  |  |
| 00 F                                                                            | 6 03                                                                              | 1.66                                                                                                             | 0.0450                                                                                                                        | 0 7202                                |  |  |  |
| 90.5                                                                            | 11.08                                                                             | 4.00<br>9.72                                                                                                     | 0.092                                                                                                                         | 0.7392                                |  |  |  |
|                                                                                 | 16.14                                                                             | 14.77                                                                                                            | 0.138                                                                                                                         | 0.9043                                |  |  |  |
|                                                                                 | 26.26                                                                             | 24.90                                                                                                            | 0.230                                                                                                                         | 0.9382                                |  |  |  |
| P <sup>+</sup> part                                                             | ial pressu                                                                        | re of helium                                                                                                     |                                                                                                                               |                                       |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  | TNEODMATION                                                                                                                   |                                       |  |  |  |
| METHOD /A                                                                       | זת/ פוזשגת גת                                                                     | AUXILIANI                                                                                                        | ICOURCE AND DUDITY OF MATE                                                                                                    | DTALC.                                |  |  |  |
| METHOD / A                                                                      | PPARATUS/PF                                                                       | WCEDURE:                                                                                                         | SOURCE AND PURITY OF MATE                                                                                                     | RIALS:                                |  |  |  |
| vapor ri<br>recircul<br>measured<br>thermome<br>Bourdon<br>liquid a<br>ferometr | lating pump<br>l with plat<br>eter, press<br>gauge. S<br>analysed by<br>ry. Detai | b. Temperature<br>inum resistance<br>ure measured with<br>amples of gas and<br>gas phase inter-<br>ls in source. | <ol> <li>High purity conta<br/>than 0.008% hydro<br/>nitrogen, 0.005%<br/>hydrocarbons.</li> <li>No details given.</li> </ol> | gen, 0.02%<br>oxygen and 0.07%        |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  | ESTIMATED ERROR:                                                                                                              |                                       |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  | $\delta T/K = \pm 0.02 \text{ to } 0.03;$<br>0.2 bar; $\delta x_{\text{He}} \approx \delta y_{\text{He}}$<br>0.00002.         | $\delta P$ less than<br>= ±0.00001 to |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  | REFERENCES:                                                                                                                   |                                       |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  |                                                                                                                               |                                       |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  |                                                                                                                               |                                       |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  |                                                                                                                               |                                       |  |  |  |
|                                                                                 |                                                                                   |                                                                                                                  | J                                                                                                                             |                                       |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Skripka, V. G. and Lobonova, N. N., (1) Helium; He; 7440-59-7 Trudy Vses. Nauch.-Issled. Inst. (2) 7440-37-1 Argon; Ar; Kriog. Mashinostr., 1971, 13, 90. VARIABLES: PREPARED BY: C. L. Young Temperature, pressure **EXPERIMENTAL VALUES:** Mole fraction of helium Mole fraction of helium T/K P/bar in liquid, in vapor, T/K P/bar in liquid, in vapor,  $x_{\rm He}$  $x_{\rm He}$ y<sub>He</sub> y<sub>He</sub> 0.8300 90.67 9.8 0.0010 -102.95 39.2 0.0080 19.6 0.0021 49.0 0.8590 0.0099 0.9230 29.4 0.0032 58.8 0.0118 0.8790 39.2 0.9380 0.0043 68.6 0.0137 0.8930 49.0 0.0055 0.9485 0.0155 0.9030 78.5 58.8 0.9110 88.3 0.0066 0.9565 0.0174 0.9620 98.1 68.6 0.0075 0.0192 0.9180 78.5 0.9650 107.9 0.0088 0.0209 0.9245 88.3 0.0098 0.9675 117.7 0.0226 0.9300 98.1 0.0109 0.9695 127.5 0.0242 0.9350 107.9 137.3 0.0258 0.0119 0.9715 0.9385 117.7 0.0129 0.9740 147.1 0.0273 0.9420 127.5 0.9755 156.9 0.9450 0.0138 0.0287 137.3 0.0146 0.9770 166.7 0.0302 0.9480 0.0154 0.9775 147.1 0.9500 176.5 0.0315 156.9 0.0161 0.9780 186.3 0.0328 0.9525 166.7 0.9790 196.1 0.9550 0.0168 0.0342 176.5 0.0175 0.9805 205.9 0.0354 0.9570 186.3 0.0183 0.0366 0.9585 0.9815 215.7 196.1 0.0190 0.9830 115.09 0.0005 9.8 -19.6 205.9 0.0197 0.9840 0.0046 29.4 0.0204 0.9845 0.4650 215.7 0.0085 102.95 9.8 0.0018 39.2 0.0120 0.5850 19.6 0.0040 49.0 0.0153 0.6640 29.4 0.7815 0.0061 58.8 0.0183 0.7140 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD / APPARATUS / PROCEDURE : High purity sample purity 98.9 mole Rocking autoclave partially filled with liquid and then pressurized with per cent. Temperature measured 2. High purity sample purity 99.99 gas. Samples of phases analysed by interferometry. mole per cent. with platinum resistance thermometer and pressure with Bourdon gauge. Details in source. **ESTIMATED ERROR:**  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.4;$ <sup>δx</sup>He′  $\delta y_{\rm He} = \pm 0.0002.$ **REFERENCES:** 

ORIGINAL MEASUREMENTS: COMPONENTS: Helium; He; 7440-59-7 Skripka, V. G. and Lobonova, N. N., (1) Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, 13, 90. (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: Mole fraction of helium T/K P/bar in liquid, in vapor,  $x_{\rm He}$  $y_{\rm He}$ 115.09 68.6 0.0216 0.7480 78.5 0.0247 0.7730 88.3 0.0278 0.7930 98.1 0.0310 0.8080 107.9 0.0341 0.8215 117.7 0.0370 0.8320 0.0400 127.5 0.8420 137.3 0.0428 0.8505 0.8580 147.1 0.0456 156.9 0.0483 0.8650 166.7 0.0503 0.8700 176.5 0.0533 0.8760 186.3 0.0557 0.8800 196.1 0.8840 0.0579 205.9 0.0600 0.8880 215.7 0.0621 0.8920

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| _        |                   |                                  |                       |                       |                     |                       |                 |  |
|----------|-------------------|----------------------------------|-----------------------|-----------------------|---------------------|-----------------------|-----------------|--|
| COMPONEN | TS:               |                                  |                       | ORIGINAL              | MEASUREME           | NTS:                  |                 |  |
| (1) H    | elium;            | He; 7440-59-7                    |                       | Streett               | . W. В.             | and Hill, J.          | L. E.,          |  |
| (2) A    | rgon; A           | Ar; 7440-37-1                    |                       | Trans.                | Faraday             | Soc., <u>1971</u> , 6 | 7,622.          |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
| VARIABLI | ES :              |                                  |                       | PREPARED              | BY:                 |                       |                 |  |
| Temper   | ature, p          | oressure                         |                       | с. г. х               | oung                |                       |                 |  |
| EXPERIME | ENTAL VALU        | ES:<br>Molo fraction             | n of holium           |                       |                     | Molo fraction         | of holium       |  |
| т/к      | P/bar             | in liquid,                       | in vapor,             | т/к                   | P/bar               | in liquid,            | in vapor,       |  |
|          |                   | <sup>x</sup> He                  | <sup>у</sup> Не       |                       |                     | <sup>x</sup> He       | <sup>y</sup> He |  |
| 98.02    | 220.9             | 0.0229                           | 0.9740                | 120.01                | 1172.3              | 0.1284                | 0.9557          |  |
|          | 420.5             | 0.0347                           | 0.9802                |                       | 1447.9              | 0.1286                | 0.9588          |  |
|          | 482.3             | 0.0376                           | 0.9816                |                       | 1585.7              | 0.1315                | 0.9650          |  |
|          | 627.2             | 0.0430                           | 0.9817                |                       | 1861.3              | 0.1316                | 0.9678          |  |
|          | 717.4             | 0.0452                           | 0.9834                |                       | 1930.2              | 0.1316                | 0.9705          |  |
| 108.17   | 489.4             | 0.0602                           | 0.9622                |                       | 1999.1              | 0.1316                | 0.9705          |  |
|          | 757.9             | 0.0721                           | 0.9670                |                       | 2111.6              | 0.1313                | 0.9705          |  |
|          | 896.7             | 0.0762                           | 0.9747                | 129.74                | 358.7               | 0.1185                | 0.8555          |  |
|          | 965.6             | 0.0776                           | 0.9754                |                       | 482.3               | 0.1395                | 0.8761          |  |
|          | 1103.4            | 0.0802                           | 0.9774                |                       | 757.9               | 0.1671                | 0.9078          |  |
|          | 1179.4            | 0.0813                           | 0.9774                |                       | 896.7               | 0.1754                | -               |  |
|          | 1224.0            | 0.0819                           | 0.9774                |                       | 1034.5              | 0.1836                | 0.9360          |  |
|          | 1241.2            | 0.0834                           | 0.9774                |                       | 1361.8              | 0.1848                | 0.9413          |  |
|          | 1261.5            | 0.0841                           | 0.9774                |                       | 1585.7              | 0.1856                | 0.9492          |  |
| 120.01   | 344.5             | 0.0796                           | 0.9117                |                       | 2068.0              | 0.1812                | -               |  |
|          | 613.0             | 0.1078                           | 0.9372                |                       | 2413.6              | 0.1769                | 0.9595          |  |
|          | 744.7<br>896.7    | 0.1152                           | 0.9426                |                       | 2620.3              | 0.1746                | 0.9616          |  |
|          | 1034.5            | 0.1253                           | 0.9528                |                       | 2827.0              | 0.1722                | 0.9692          |  |
|          |                   |                                  | AUXILIARY             | INFORMATIO            | ОМ                  |                       |                 |  |
| METHOD / | APPARAT           | US/PROCEDURE:                    |                       | SOURCE AN             | D PURITY            | OF MATERIALS:         |                 |  |
| Recircu  | lating            | vapor flow app                   | paratus               | No details given.     |                     |                       |                 |  |
| ture.    | Ignetic<br>Temper | pump at ambier<br>ature measured | it tempera-<br>l with |                       |                     |                       |                 |  |
| platin   | um resis          | tance thermome                   | ter.                  |                       |                     |                       |                 |  |
| Pressur  | e measu           | red with Bourd                   | lon gauge.            |                       |                     |                       |                 |  |
| Decaris  | s III SOU.        | rce and rer. I                   | •                     |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       | ESTIMATEI             | ERROR:              | 17/ham - +0 E.        |                 |  |
|          |                   |                                  |                       | OT/K = 2              | EU.UI;              | $oP/bar = \pm 0.5;$   |                 |  |
|          |                   |                                  |                       | $^{\circ x}$ He = $($ | $y_{\text{He}} = 0$ | .001.                 |                 |  |
|          |                   |                                  |                       | REFERENCE             | ES:                 |                       |                 |  |
|          |                   |                                  |                       | 1. Stree              | ett, W.             | B., Cryogenics        | , 1965,         |  |
|          |                   |                                  |                       | 5, 27                 | 7.                  |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |
|          |                   |                                  |                       |                       |                     |                       |                 |  |

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| COMPONENTS: |          |                  |                 | ORIGINAL MEASUREMENTS: |                     |                 |                   |
|-------------|----------|------------------|-----------------|------------------------|---------------------|-----------------|-------------------|
| (1) H       | elium; H | e; 7440-59-7     |                 | Street                 | t, W. B.<br>Faraday | and Hill, J.    | L. E.,<br>7. 622. |
| (2) A:      | rgon; A  | r; 7440-37-1     |                 | 11 4.00                | r ur uu ug          | <u> </u>        |                   |
|             |          |                  |                 |                        |                     |                 |                   |
|             |          |                  |                 |                        |                     |                 |                   |
| EXPERIM     | ENTAL VA | ALUES:           |                 |                        |                     |                 |                   |
| m / 12      | P/har    | Mole fraction    | of helium       | ጥ / ሦ                  | Phar                | Mole fraction   | of helium         |
| 1/1         | 17bai    | <sup>x</sup> He  | <sup>y</sup> He | 17 K                   | 17bai               | <sup>x</sup> He | <sup>y</sup> He   |
| 129.74      | 2880.7   | 0.1720           | 0.9662          | 147.80                 | 314.1               | 0.3050          | 0.4721            |
| 139.39      | 344.5    | 0.1765           | 0.7502          |                        | 351.6               | 0.3641          | -                 |
|             | 620.1    | 0.2347           | 0.8157          |                        | 585.7               | 0.4317          | 0.5452            |
|             | 757.9    | 0.2479           | 0.8353          |                        | 610.0               | -               | 0.5753            |
|             | 896.7    | 0.2563           | 0.8520          |                        | 627.2               | 0.4272          | 0.5985            |
|             | 1172 3   | 0.2605           | 0.8059          |                        | 689 0               | 0.4278          | 0.6052            |
|             | 1312.1   | 0.2629           | 0.8875          |                        | 827.8               | 0.4090          | 0.6928            |
|             | 1447.9   | 0.2611           | 0.8961          |                        | 965.6               | 0.4054          | 0.7338            |
|             | 1723.5   | 0.2581           | 0.9091          | 148.03                 | 96.3                | 0.0854          | 0.2787            |
|             | 2275 8   | 0.2529           | 0.9195          |                        | 179 3               | 0.144           | 0.3556            |
|             | 2551.4   | 0.2405           | 0.9333          |                        | 228.0               | 0.2400          | 0.4183            |
|             | 2827.0   | 0.2329           | 0.9392          |                        | 262.4               | 0.3110          | 0.3892            |
|             | 2895.9   | 0.2329           | 0.9406          |                        | 658.6               | 0.4559          | 0.5981            |
|             | 3033.7   | 0.2307           | 0.9419          |                        | 836.9               | 0.4320          | 0.6806            |
|             | 3102.6   | 0.2285           | 0.9499          |                        | 895.7               | 0.4122          | 0.7093            |
|             | 3171.5   | 0.2277           | 0.9509          |                        | 1043.6              | 0.4087          | 0.7492            |
|             | 3240.4   | 0.2261           | 0.9513          |                        | 1172.3              | 0.3984          | 0.7822            |
|             | 3454.2   | 0.2238           | 0.9545          |                        | 1654.6              | 0.3662          | 0.8466            |
|             | 3581.8   | 0.2226           | 0.9556          |                        | 1930.2              | 0.3506          | 0.8713            |
| 145 00      | 3619.3   | 0.2224           | 0.9556          |                        | 2068.0              | 0.3401          | 0.8818            |
| 145.00      | 2/50.8   | 0.2805           | -               |                        | 2413.6              | 0.3261          | 0.8989            |
|             | 3447.1   | 0.2598           | -               |                        | 3102.6              | 0.2983          | 0.9253            |
|             | 3792.6   | 0.2494           | 0.9379          |                        | 3461.3              | 0.2869          | 0.9326            |
| 146 00      | 4219.2   | 0.2480           | 0.9383          | 148.30                 | 757.9               | 0.4982          | -                 |
| 140.90      | 275.6    | 0.2188           | 0.4957          |                        | 793.4<br>827.8      | 0.4795          | 0.5796            |
|             | 344.5    | 0.3008           | -               |                        | 965.6               | 0.4308          | 0.7137            |
|             | 434.7    | 0.3425           | 0.5876          |                        | 1103.4              | 0.4157          | 0.7476            |
|             | 496.5    | 0.35/6           | 0.6127          |                        | 1241.2              | 0.4054          | 0.7751            |
|             | 689.0    | 0.3817           | 0.6810          | 149.00                 | 892.7               | 0.4855          | 0.6362            |
|             | 827.8    | 0.3842           | 0.7282          |                        | 958.5               | -               | 0.6821            |
|             | 965.6    | 0.3822           | 0.7571          |                        | 1061.9              | 0.4385          | 0.7222            |
|             | 1241.2   | 0.3696           | 0.7778          |                        | 1379 0              | 0.4256          | 0.7502            |
|             | 1379.0   | 0.3614           | 0.8203          |                        | 1654.6              | 0.3826          | 0.8325            |
|             | 1654.6   | 0.3479           | 0.8520          |                        | 1930.2              | 0.3626          | 0.8604            |
|             | 2068.0   |                  | 0.8818          |                        | 2482.5              | 0.3319          | 0.8907            |
|             | 2413.0   | 0.31/4<br>0.3040 | _<br>0.9]17     |                        | 2027.U<br>3426.8    | 0.2937          | 0.9098            |
|             | 3102.6   | 0.2942           | 0.9208          |                        | 3792.6              | 0.2851          | 0.9372            |
| 147.30      | 344.5    | 0.3105           | 0.5349          | 150.02                 | 1034.5              | 0.5239          | 0.6097            |
|             | 413.4    | 0.3546           | 0.5536          |                        |                     | 0.4861          | 0.6708            |
|             | 689.0    | 0.4089           | 0.6607          |                        | 1379.0              | 0.4287          | 0.7698            |
|             | 827.8    | 0.4045           | 0.7064          |                        | 1516.8              | 0.4104          | 0.7921            |
| 147.80      | 213.8    | 0.2269           | 0.4476          |                        | 1723.5              | 0.3955          | 0.8284            |
|             | 205.0    | 0.2653           | 0.4604          |                        | 2075.1              | 0.3691          | 0.8561            |

(cont.)

 COMPONENTS:
 ORIGINAL MEASUREMENTS:

 (1) Helium; He; 7440-59-7
 Streett; W. B. and Hill, J. L. E.,

 (2) Argon; Ar; 7440-37-1
 Trans. Faraday Soc., 1971, 67, 622.

EXPERIMENTAL VALUES:

| т/к    | P/bar | Mole fraction<br>in liquid<br><sup>x</sup> He | of<br>in | helium<br>vapor,<br><sup>y</sup> He | T/K    | P/bar | Mole fraction<br>in liguid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He |
|--------|-------|-----------------------------------------------|----------|-------------------------------------|--------|-------|------------------------------------------------|-------------------------------------------|
|        |       |                                               |          |                                     |        |       |                                                |                                           |
| 150.02 | 2424  | 0.3491                                        | 0.8      | 3862                                | 155.94 | 3786  | 0.3485                                         | 0.9065                                    |
|        | 2765  | 0.3322                                        | 0.9      | 9039                                |        | 4137  | 0.3399                                         | 0.9214                                    |
|        | 3006  | 0.3204                                        | 0.9      | 9117                                | 158.09 | 2220  | 0.5749                                         | 0.6943                                    |
|        | 3447  | 0.3062                                        | 0.9      | 9247                                |        | 2251  | -                                              | 0.7187                                    |
|        | 3793  | -                                             | 0.9      | 346                                 |        | 2276  | 0.5293                                         | 0.7471                                    |
|        | 4137  | 0.2895                                        | 0.9      | 425                                 |        | 2441  | 0.4964                                         | 0.7789                                    |
| 150.99 | 1179  | 0.5612                                        |          | -                                   |        | 2482  | 0.4855                                         | -                                         |
|        | 1241  | 0.5057                                        | 0.6      | 5718                                |        | 2800  | 0.4432                                         | 0.8260                                    |
|        | 1310  | 0.4788                                        |          | -                                   |        | 2992  | 0.4199                                         | 0.8454                                    |
|        | 1379  | 0.4656                                        | 0.7      | /122                                | 159.90 | 2503  | 0.5978                                         | 0.6967                                    |
|        | 1586  | -                                             | 0.7      | 7800                                |        | 2520  | 0.5776                                         | 0.7117                                    |
|        | 1724  | 0.4169                                        | 0.8      | 3125                                |        | 2551  | 0.5578                                         | 0.7297                                    |
| 155.94 | 1940  | 0.5616                                        | 0.7      | 7078                                |        | 2599  | 0.5389                                         | 0.7539                                    |
|        | 1952  | 0.5554                                        | 0.7      | 7187                                |        | 2662  | 0.5210                                         | -                                         |
|        | 1982  | 0.5427                                        | 0.7      | 7323                                |        | 2751  | 0.5036                                         | -                                         |
|        | 2006  | 0.5345                                        | 0.7      | 7430                                |        | 2827  | 0.4886                                         | -                                         |
|        | 2031  | -                                             | 0.7      | /539                                |        | 2920  | 0.4755                                         | 0.8272                                    |
|        | 2206  | 0.4821                                        | 0.7      | /943                                |        | 3013  | -                                              | 0.8354                                    |
|        | 2414  | 0.4476                                        | 0.8      | 3239                                |        | 3103  | 0.4578                                         | 0.8431                                    |
|        | 2758  | 0.4122                                        | 0.8      | 3573                                |        | 3447  | 0.4211                                         | 0.8713                                    |
|        | 3103  | 0.3853                                        | 0.8      | 3794                                |        | 3793  | 0.4004                                         | 0.8862                                    |
|        | 3447  | 0.3638                                        | 0.8      | 3938                                |        | 4137  | 0.3761                                         | 0.9014                                    |

| COMPONENTS: |            |                      |                 | ORIGINAL MEASUREMENTS: |                   |                                |                  |
|-------------|------------|----------------------|-----------------|------------------------|-------------------|--------------------------------|------------------|
| (1) 1       | Helium;    | He; 7440-59-7        |                 | Parrish                | , W. R.           | and Stewart,                   | W. G.,           |
| (2) (       | Tarbon m   | opovide: CO.         | 530-08-0        | J. Chem.               | . Engng           | . Data, <u>1975</u> ,          | 20, 412.         |
|             |            | onoxide, co,         |                 |                        |                   |                                |                  |
| 1           |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
| <u> </u>    |            |                      |                 |                        |                   |                                |                  |
| VARIABLE    | ES:        |                      |                 | PREPARED               | BY:               |                                |                  |
| Тетре       | rature.    | pressure             |                 | C. L. YC               | nunα              |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
| EXPERIME    | SNTAL VALU | ES:<br>Molo function | af halium       |                        |                   |                                |                  |
| <b>π/</b> κ | P/har      | in liquid            | in vapor        | ጥ / አ                  | P/har             | Mole fraction                  | n of helium      |
| 1/1         | 1 / Dar    | $x_{-}$              | $u_{-}$         | 171                    | ry bar            | $x_{-}$                        | $u_{-}$          |
|             |            | He                   | <sup>5</sup> He |                        |                   | ~He                            | <sup>9</sup> He  |
| 79.50       | 41.2       | 0.0047               | -               | 120.00                 | 105.1             | 0.0767                         | -                |
|             | 41.5       | 0.0048               | -               |                        | 138.0             | 0.1003                         | -                |
|             | 69.1       | 0.0077               | -               | 80.00                  | 11.9              | -                              | 0.9204           |
|             | 69.4       | 0.0079               | -               |                        | 13.7              | -                              | 0.9303           |
|             | 102.7      | 0.0115               | -               |                        | 28.8              | -                              | 0.9636           |
|             | 134.9      | 0.0143               | -               |                        | 42.3              | -                              | 0.9732           |
|             | 136.1      | 0.0146               | -               |                        | 69.8              | -                              | 0.9821           |
| 84.71       | 69.0       | 0.0105               | -               |                        | 136.4             | -                              | 0.9885           |
|             | 69.4       | 0.0107               | -               | 84.71                  | 6.9               | -                              | 0.8709           |
|             | 102.9      | 0.0152               | -               |                        | 7.0               | -                              | 0.8713           |
|             | 135.3      | 0.0185               | _               |                        | 28.8              | -                              | 0.9395           |
|             | 136.2      | 0.0186               | -               |                        | 42.8              | -                              | 0.9563           |
| 90.00       | 35.6       | 0.0072               | -               |                        | 56.4              | -                              | 0.9649           |
|             | 69.4       | 0.0141               | -               |                        | 70.9              | -                              | 0.9703           |
|             | 135.6      | 0.0203               | _               | 90 00                  | 104.0             | -                              | 0.9///           |
|             | 136.9      | 0.0254               | -               | 50.00                  | 26.7              | -                              | 0.8918           |
| 100.00      | 37.1       | 0.0116               | -               |                        | 40.1              | -                              | 0.9239           |
|             | 70.1       | 0.0227               | -               |                        | 55.6              | -                              | 0.9413           |
|             | 104.3      | 0.0333               | -               |                        | 71.2              | -                              | 0.9515           |
| 120.00      | 36.5       | 0.0174               | -               |                        | 137.6             | -                              | 0.9689           |
|             | 69.9       | 0.0478               | -               | 100.00                 | 13.4              | -                              | 0.5471           |
| ļ           |            |                      |                 |                        |                   |                                |                  |
|             |            |                      | AUXILIARY       | INFORMATIC             | ON                |                                |                  |
| <u> </u>    |            |                      |                 | LOUDGE AN              |                   | OR MARDETAL C.                 |                  |
| METHOD /    | APPARATI   | JS/PROCEDURE:        |                 | SOURCE AN              | D PURITY          | OF MATERIALS:                  |                  |
| Vapor       | recircu    | lation system        | similar to      | 1. No                  | detail            | s given.                       |                  |
| that i      | n ref.     | 1. Pressure          | measured        | 2. Ult                 | rapure            | purity better                  | than             |
| measur      | ed with    | platinum resi        | stance          | 99.                    | 8 mole            | per cent.                      |                  |
| thermo      | meter.     | Samples of 1         | iquid and       |                        |                   |                                |                  |
| vapor       | analysed   | l by gas chrom       | atography.      |                        |                   |                                |                  |
| Detail      | s in sou   | irce.                |                 |                        |                   |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 | 1                      |                   |                                |                  |
| }           |            |                      |                 | ESTIMATED              | ERROR:            |                                |                  |
|             |            |                      |                 | $OT/K = \pm$           | 0.013;            | $\delta P/\text{bar} = \pm 0.$ | 07;              |
|             |            |                      |                 | He 0                   | <sup>9</sup> He - | 10.002 OI 128                  | wintchever       |
| 1           |            |                      |                 | 115 great              | er.               |                                |                  |
|             |            |                      |                 | REFERENCE              | s:                |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 | 1. Dunc                | an, A.            | G. and Hiza,                   | M. J.,           |
| 1           |            |                      |                 | Aav.                   | cryog             | . Engng., <u>1970</u>          | <u>,</u> 15, 42. |
|             |            |                      |                 |                        |                   |                                |                  |
|             |            |                      |                 |                        |                   |                                |                  |
| 1           |            |                      |                 |                        |                   |                                |                  |
| L           |            |                      |                 | 1                      |                   |                                |                  |

| Сомро | ONENTS:                                                                           |                                                | · · · ·                                                                                          | ORIGINAL MEASUREMENTS:                                                    |
|-------|-----------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| (1)   | Helium; H                                                                         | Ie; 7440-59-7                                  |                                                                                                  | Parrish, W. R. and Stewart, W. G.,<br>L. Chom. Engng. Data, 1975, 20, 412 |
| (2)   | Carbon monoxide; CO; 630-08-0                                                     |                                                |                                                                                                  | 5. Chem. Engry. Data, <u>1375</u> , 20, 122.                              |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  | 1                                                                         |
| т/к   | P/bar                                                                             | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He                                                        | n<br>,                                                                    |
| 100.0 | ) 27.4<br>27.9<br>29.3<br>39.0<br>41.4                                            | -                                              | 0.7594<br>0.7596<br>0.7712<br>0.8195<br>0.8279<br>0.8668                                         |                                                                           |
| 120.0 | 69.8<br>70.2<br>103.9<br>131.0<br>131.8<br>132.7<br>132.9<br>29.3<br>42.5<br>56.7 |                                                | 0.8863<br>0.8865<br>0.9154<br>0.9274<br>0.9275<br>0.9281<br>0.9282<br>0.2401<br>0.4053<br>0.5082 |                                                                           |
|       | 70.5<br>103.8<br>137.1                                                            | -                                              | 0.5806<br>0.6735<br>0.7256                                                                       |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |
|       |                                                                                   |                                                |                                                                                                  |                                                                           |

| COMPONENTS:                          | ORIGINAL MEASUREMENTS:                                                                       |
|--------------------------------------|----------------------------------------------------------------------------------------------|
| (1) Helium; He; 7440-59-7            | Sinor, J. E. and Kurata, F., J. Chem.                                                        |
| (2) Carbon monoxide; CO; 630-08-0    | Eng. Data, <u>1966</u> , 11, 537.                                                            |
|                                      |                                                                                              |
|                                      |                                                                                              |
| VARIABLES:                           | PREPARED BY:                                                                                 |
| Temperature, pressure                | C. L. Young                                                                                  |
| Imperature, pressure                 |                                                                                              |
| EXPERIMENTAL VALUES:                 |                                                                                              |
| T/K P/bar Mole fraction of           | helium in liquid, x <sub>He</sub>                                                            |
| 77.35 17.2                           | 0.0030                                                                                       |
| 34.5                                 | 0.0045<br>0.0062                                                                             |
| 68.95                                | 0.0073                                                                                       |
| 86.18                                | 0.0094                                                                                       |
| 103.4                                | 0.0106                                                                                       |
| 120.7                                | 0.0122                                                                                       |
|                                      | U.UI34<br>0.0042                                                                             |
| 34.5                                 | 0.0042                                                                                       |
| 51.7                                 | 0.0135                                                                                       |
| 68.95                                | 0.0189                                                                                       |
| 86.18                                | 0.0221                                                                                       |
| 120.7                                | 0.0249                                                                                       |
| 137.9                                | 0.0328                                                                                       |
| 11.15 34.5                           | 0.0164                                                                                       |
| 51.7                                 | 0.0290                                                                                       |
| 86 18                                | U.U396<br>0.0510                                                                             |
| 103.4                                | 0.0605                                                                                       |
| 120.7                                | 0.0700                                                                                       |
| 137.9                                | 0.0781                                                                                       |
|                                      | 0.0424                                                                                       |
| 86-18                                | 0.0965                                                                                       |
| 103.4                                | 0.1214                                                                                       |
| 120.7                                | 0.1455                                                                                       |
|                                      | INFORMATION                                                                                  |
|                                      | CONDER AND DIDITY OF MATEDIALS.                                                              |
| Static equilibrium cell (0 1 0 capa- | DURCE AND FURITI OF MALERIALS:                                                               |
| city) fitted with magnetic stirrer   | mum impurity 12 parts per million                                                            |
| Temperature measured with platinum   | 2. Olin-Matheson sample purity 99.5                                                          |
| resistance thermometer. Pressure     | mole per cent.                                                                               |
| measured with Bourdon gauge.         |                                                                                              |
| brated liquid samples withdrawn and  |                                                                                              |
| analysed by G.C. Details in source   |                                                                                              |
| and ref. 1.                          |                                                                                              |
|                                      |                                                                                              |
|                                      |                                                                                              |
| <b>,</b>                             | ESTIMATED ERROR:                                                                             |
|                                      | $\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.1;$                                            |
|                                      | $     \delta x_{\text{He}} = \pm 1\% \text{ or } \pm 0.0003 \text{ (whichever is greater)} $ |
|                                      | DEEDENCES                                                                                    |
|                                      | I Sinor J E Schindler D I                                                                    |
|                                      | and Kurata. F., Am. Inst. Chem                                                               |
|                                      | Engnrs. J., <u>1966</u> , 12, 353.                                                           |
|                                      |                                                                                              |
|                                      |                                                                                              |
|                                      |                                                                                              |

| COMPONENTS:                                                                                 | EVALUATOR:                                                                                                  |  |  |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Carbon dioxide; CO<sub>2</sub>; 124-38-9</li> </ol> | Colin Young,<br>School of Chemistry,<br>University of Melbourne,<br>Parkville, Victoria, 3052<br>AUSTRALIA. |  |  |

CRITICAL EVALUATION:

The solubility of helium in carbon dioxide has been studied at high pressures by Tsiklis (1), MacKendrick *et al*. (2) and Burfield *et al*. The study of Tsiklis covered the temperature range 298 K to 353 K and its main aim was to discover the phase behaviour in order to establish that this mixture exhibits gas-gas immiscibility. It was found to exhibit gas-gas immiscibility of the first kind (3). Since only graphical data were presented, these are rejected for the present purposes.

The data of MacKenrick *et al.* (2), while not of the highest precision, appear to be self-consistent and are classified as tentative. The data of Burfield *et al.* (4) are slightly ( $\sim$  5%) lower than those of MacKendrick *et al.* and are classified as tentative.

## References

- 1. Tsiklis, D. S., Doklady Acad. Nauk S.S.S.R., 1952. 86, 1159.
- MacKendrick, R. F., Heck, C. K. and Barrick, P. L., J. Chem. Engng. Data 1968, 13, 352.
- Schneider, G. M., in Chemical Thermodynamics Vol. 2 Specialist Periodical Report, Chapter 4, ed. McGlashan, M. L., Chemical Society, London, <u>1978</u>.
- 4. Burfield, D. W., Richardson, H. P. and Guereca, R. A., Am. Inst. Chem. Engnrs. J., 1970, 16, 97.

|                          | _,                  |                               |                                                                    | ······                                |                  |                                   |                  |  |
|--------------------------|---------------------|-------------------------------|--------------------------------------------------------------------|---------------------------------------|------------------|-----------------------------------|------------------|--|
| COMPONENTS:              |                     |                               |                                                                    | ORIGINAL MEASUREMENTS:                |                  |                                   |                  |  |
| 1. Helium; He; 7440-59-7 |                     |                               | Burfield, D. W., Richardson, H. P.                                 |                                       |                  |                                   |                  |  |
| 2. Car                   | bon dio:            | xide; CO <sub>2</sub> ; 1:    | 24-38-9                                                            | and Gue                               | reca, R          | . A., Am. Inst.                   | . Chem.          |  |
|                          |                     |                               |                                                                    | Engnrs. J., <u>1970</u> , 16, 97.     |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
| VARIABLES                | 5:                  |                               |                                                                    | PREPARED BY:                          |                  |                                   |                  |  |
| Tempera                  | ture. D'            | reggiire                      |                                                                    | С. Ц. У                               | oung             |                                   |                  |  |
| Tempera                  | Curc, F.            | ressure                       |                                                                    |                                       |                  |                                   |                  |  |
| EXPERIMEN                | TAL VALU            | ES:                           |                                                                    |                                       |                  | <u> </u>                          |                  |  |
| m /v                     | D /har              | Mole fraction                 | of helium                                                          | m /12                                 | D/har            | Mole fraction                     | of helium        |  |
| TYK                      | r/Dai               | <sup>x</sup> He               | <sup>y</sup> He                                                    | 1/1                                   | r / Dur          | <sup>x</sup> He                   | <sup>y</sup> He  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
| 293.13                   | 57.31               | 0.0000                        | 0.0000                                                             | 273.26                                | 81.98            | 0.0181                            | 0.4594           |  |
|                          | 66.06               | 0.0069                        | 0.0705                                                             |                                       | 89.00            | 0.0210                            | 0.4983           |  |
|                          | 88.04               | 0.0190                        | 0.1960                                                             |                                       | 129.12           | 0.0293                            | 0.6394           |  |
|                          | 97.03<br>106.77     | 0.0237<br>0.0303              | 0.2466<br>0.2843                                                   | 253.11                                | 136.38<br>19.84  | 0.0310<br>0.0000                  | 0.6569<br>0.0000 |  |
|                          | 121.10              | 0.0370                        | 0.3429                                                             |                                       | 29.84            | 0.0020                            | 0.2860           |  |
|                          | 141.11              | 0.0427                        | 0.4160                                                             |                                       | 47.36            | 0.0055                            | 0.5070           |  |
| 273.26                   | 34.99<br>37.81      | 0.0000<br>0.0010              | 0.0000<br>0.0448                                                   |                                       | 55.36<br>64.07   | 0.0070<br>0.0080                  | 0.5723<br>0.6300 |  |
|                          | 40.84               | 0.0022                        | 0.0941                                                             |                                       | 77.43            | 0.0102                            | 0.6836           |  |
|                          | 51.70               | 0.0048                        | 0.2225                                                             |                                       | 110.20           | 0.0161                            | 0.7876           |  |
|                          | 61.67<br>67.30      | 0.0089<br>0.0142              | 0.3197<br>0.3630                                                   |                                       | 117.19<br>138.88 | 0.0190<br>0.0173                  | 0.7991<br>0.8183 |  |
|                          | 75.50               | 0.0173                        | 0.4232                                                             |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               | AUXILIARY                                                          | INFORMATI                             | ON               |                                   |                  |  |
| METHOD/A                 | PPARATUS            | 3/PROCEDURE:                  |                                                                    | SOURCE AND PURITY OF MATERIALS:       |                  |                                   |                  |  |
| Recircu                  | lating v            | vapor flow appa               | aratus<br>ro                                                       | 1. Bureau of Mines, Ultrapure sample, |                  |                                   |                  |  |
| measure                  | d with t            | transducer cali               | ibrated                                                            | million.                              |                  |                                   |                  |  |
| tempera                  | dead we<br>ture mea | eight piston basured with the | ilance;<br>ermo-                                                   | 2. Pur                                | ity bett         | er than 99.98                     | mole per         |  |
| couple.                  | Samp]<br>by mag     | les of coexisti               | ing phases                                                         | cent.                                 |                  |                                   |                  |  |
| Details                  | in sour             | rce.                          | · •                                                                |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    | ESTIMATE                              | D ERROR:         |                                   |                  |  |
|                          |                     |                               | $\delta T/K = \pm 0.05;  \delta P/bar = \pm 0.1;  \delta x_{He} =$ |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    | ±0.0001                               | to 0.00          | $005;  \delta y_{\rm He} = \pm 0$ | 0.001.           |  |
|                          |                     |                               |                                                                    | REFERENC                              | ES:              |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |
|                          |                     |                               |                                                                    |                                       |                  |                                   |                  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: MacKendrick, R. F., Heck, C. K. and Barrick, P. L., J. Chem. Engng. Data, <u>1968</u>, 13, 352. (1) Helium; He; 7440-59-7 (2) Carbon dioxide; CO<sub>2</sub>; 124-38-9 VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium T/K in vapor, T/K P/bar in liquid, P/bar in liquid, in vapor,  $y_{\rm He}$  $x_{\text{He}}$  $x_{\rm He}$ <sup>y</sup>He 219.9 9.93 0.372 244.9 85.32 0.0121 0.784 \_ 11.75 0.460 0.0141 -99.20 16.52 -0.621 99.60 0.810 36.17 0.817 108.8 0.0156 0.823 140.2 90.38 0.00581 0.9225 0.0204 0.864 123.0 0.00868 0.9419 157.1 0.0226 159.5 145.4 0.0103 0.9498 0.874 162.2 0.0114 0.9543 176.7 0.0249 0.0141 177.3 193.3 0.9612 0.883 -229.9 14.6 0.354 190.5 0.893 0.00064 14.8 200.3 0.0286 29.8 0.00241 0.674 202.2 0.898 45.4 0.00409 0.779 259.9 40.2 0.00428 0.322 63.9 0.00529 0.836 0.383 45.3 -91.0 0.00944 0.880 59.1 \_ 0.515 122.9 0.0129 0.9118 61.6 0.00960 0.529 160.1 0.0167 88.3 0.0160 0.653 161.5 0.9325 104.0 0.0182 194.3 0.0195 104.8 0.708 0.9407 196.1 141.7 0.0259 -0.771 244.9 19.76 -0.198 168.4 0.0312 0.801 29.79 0.441 197.1 0.0360 0.824 40.12 0.00440 0.570 274.9 43.16 0.109 0.00267 49.95 0.653 46.31 0.00384 0.149 0.00643 52.79 56.03 0.00738 0.247 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD / APPARATUS / PROCEDURE: Vapor recirculated through cell. 1. Purity 99.995 or better. Liquid and vapor samples analysed by 2. Purity 99.98 or better. gas chromatography. Pressure measured by Bourdon gauge and temperature with platinum resistance thermometer. Details in source and ref. 1 and 2. ESTIMATED ERROR:  $\delta T/K = \pm 0.1; \quad \delta P/bar = \pm 0.1$ (up to 100 bar) =  $\pm 0.3$  (above 100 bar);  $\delta x_{\rm He} \simeq \delta (1-y)_{\rm He} = \pm 5\%.$ **REFERENCES:** 1. Herring, R. N. and Barrick, R. L. Adv. Cryogenic Eng., 1965, 10, 151. Spano, J. O., Heck, C. K. and Barrick, R. L., J. Chem. Engng. Data, <u>1968</u>, 13, 168.

| _           |                                                |                 | And a subscription of the local data and the local |                                                                              |  |  |
|-------------|------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--|--|
| COMPONENTS: |                                                |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ORIGINAL MEASUREMENTS:                                                       |  |  |
| (1)         | Helium; H¢                                     | e; 7440-59-7    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | MacKendrick, R. F., Heck, C. K. and<br>Barrick, P. L., J. Chem. Engag. Data. |  |  |
| (2)         | (2) Carbon dioxide; CO <sub>2</sub> ; 124-38-9 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <u>1968</u> , <i>13</i> , 352.                                               |  |  |
|             |                                                |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                              |  |  |
| EXPER       | IMENTAL V.                                     | ALUES :         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b></b>                                                                      |  |  |
| T/K         | P/bar                                          | Mole fractio    | n of helium<br>in vapor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | n<br>C,                                                                      |  |  |
|             |                                                | <sup>x</sup> He | <sup>y</sup> He                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                              |  |  |
| 274.9       | 58.77                                          | 0.00857         | 0.262                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
|             | 27 24                                          | 0.0102          | 0 461                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
|             | 102 5                                          | 0 0241          | 0.401<br>0 527                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                              |  |  |
|             | 130 1                                          | 0.0241          | 0.527                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
|             | 141.2                                          | 0 0371          | 0.010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
|             | 172.8                                          | -               | 0.695                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
|             | 175.1                                          | 0.0492          | 0.696                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
|             | 201.2                                          | 0.0604          | 0.736                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |
| 289.9       | 62.01                                          | 0.00537         | 0.0760                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                              |  |  |
|             | 84.10                                          | 0.0184          | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                              |  |  |
|             | 85.72                                          | 0.0192          | 0.227                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |  |  |

| COMPONENTS:                     |                        |                                             | ORIGINAL MEASUREMENTS:            |                                    |                                        |  |
|---------------------------------|------------------------|---------------------------------------------|-----------------------------------|------------------------------------|----------------------------------------|--|
| (1) Holium, $Ho^3$ , 14762-55 1 |                        |                                             | Hizz M. J. Nat Bun Standards      |                                    |                                        |  |
| (1) Hellum; He ; 14/62-55-1     |                        |                                             | Hiza, M. J., Nat. Bur. Standards, |                                    |                                        |  |
| (2) n                           | -Deuteriu              | $m; n-D_2; 7782-39-0$                       | 100/                              |                                    |                                        |  |
|                                 |                        |                                             |                                   |                                    |                                        |  |
|                                 |                        |                                             |                                   |                                    |                                        |  |
| VARIABLI                        | ES:                    |                                             | PREPARED                          | BY:                                |                                        |  |
| Temper                          | ature, pr              | essure                                      | С. L. Y                           | oung                               |                                        |  |
| EXPERIM                         | ENTAL VALUE            | S:                                          |                                   |                                    | ······································ |  |
| )                               | М                      | ole fraction of helium                      |                                   | Mole                               | e fraction of helium                   |  |
| т/к                             | P/bar                  | in liquid,                                  | т/к                               | P/bar                              | in liquid,                             |  |
|                                 |                        | "He '                                       |                                   |                                    | "He '                                  |  |
|                                 |                        |                                             |                                   |                                    |                                        |  |
| 20.00                           | 0.2945<br>3.496        | 0.0000<br>0.0065(2)                         | 24.00                             | 11.301<br>13.769                   | 0.0114<br>0.0118                       |  |
| ļ                               | 6.244                  | 0.0062(6)                                   | 26.00                             | 13.927                             | 0.0124                                 |  |
|                                 | 11.859                 | 0.0083(2)                                   | 20.00                             | 5.816                              | 0.0090(8)                              |  |
| 22.00                           | 14.637                 | 0.0086(3)<br>0.0000                         |                                   | 7.040<br>8.718                     | 0.0106<br>0.0122                       |  |
|                                 | 5.078                  | 0.0072(5)                                   |                                   | 11.348                             | 0.0142                                 |  |
|                                 | 7.553<br>9.722         | 0.0083(5)                                   | 28.00                             | 2.9820                             | 0.0000                                 |  |
|                                 | 12.432                 | 0.0090(5)                                   |                                   | 9.457                              | 0.0122                                 |  |
| 24.00                           | 1.1204                 | 0.00000                                     |                                   | 15.010                             | 0.0138                                 |  |
|                                 | 4.071<br>5.730         | 0.0060(5)                                   | 30.00                             | 4.4678                             | 0.0000                                 |  |
|                                 | 6.578                  | 0.0091(5)                                   |                                   | 10.656                             | 0.0155                                 |  |
|                                 | 8.840<br>9.219         | 0.0098(1)<br>0.0107                         |                                   | 13.534<br>17.816                   | 0.0192<br>0.0257                       |  |
|                                 | 9.342                  | 0.0109                                      |                                   |                                    |                                        |  |
|                                 |                        |                                             |                                   |                                    | (cont.)                                |  |
| I                               |                        | AUXILIARY                                   | INFORMATI                         | ON                                 |                                        |  |
| METHOD                          | /APPARATU              | S/PROCEDURE:                                | SOURCE AN                         | ND PURITY OF MA                    | ATERIALS:                              |  |
| Recirc                          | ulating v              | apor flow apparatus                         | 1. USAE                           | C samples co                       | ontaining 1.4 mole                     |  |
| circul                          | opper equ<br>ating pum | p described in ref. 1.                      | per cent He'.                     |                                    |                                        |  |
| Temper                          | ature mea              | sured with platinum                         | Z. USAE                           | c sample 1.1                       | .28 HD and 0.028 H2.                   |  |
| measur                          | ed with a              | double-revolution                           |                                   |                                    |                                        |  |
| Bourdo                          | n gauge.<br>analysed   | Samples of gas and<br>by gas chromatography |                                   |                                    |                                        |  |
| using                           | thermisto              | r thermal conductivity                      |                                   |                                    |                                        |  |
| ref. 2                          | ors. De<br>•           | tails in source and                         |                                   |                                    |                                        |  |
|                                 |                        |                                             |                                   |                                    |                                        |  |
| [                               |                        |                                             | $\delta T/K = 3$                  | ±0.01; δ <i>P</i> /b               | $ar = \pm 0.004;$                      |  |
|                                 |                        |                                             | δx <sub>He</sub> з,               | $\delta y_{\text{He}^3} = \pm 3\%$ | or 0.001 whichever                     |  |
|                                 |                        |                                             | _                                 |                                    | is greater.                            |  |
|                                 |                        |                                             | REFERENCE                         | ES:<br>M. J and                    | Duncan, A G                            |  |
| 1                               |                        |                                             | Rev.                              | Sci. Instr.                        | , <u>1969</u> , <i>40</i> , 513.       |  |
|                                 |                        |                                             | 2. Dunca                          | an, A. G. an                       | d Hiza, M. J.,                         |  |
|                                 |                        |                                             | Auv.                              | orgoy. Engn                        | 9., 1510, 10, 42.                      |  |
| 1                               |                        |                                             |                                   |                                    |                                        |  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Helium; He<sup>3</sup>; 14762-55-1 Hiza, H. J., Nat. Bur. Standards, Tech. Note 621, <u>1972</u>. (2) n-Deuterium; n-D<sub>2</sub>; 7782-39-0 EXPERIMENTAL VALUES: Mole fraction of helium T/K P/bar in vapor,  $y_{\rm He^{3}}$ 20.00 0.2945 0.0000 5.286 0.9284(7)5.664 0.9305(8)8.553 0.9488(8)12.604 0.9597(5) 15.844 0.9641(3)1.1205 24.00 0.0000 3.682 0.6501 8.343 0.8202 12.504 0.8635 16.044 0.8846 28.00 2.9820 0.0000 8.808 0.5813 12.404 0.6725 14.603 0.7078 30.00 4.4678 0.0000 7.501 0.3259 10.035 13.321 17.161 0.4531 0.5542 0.6192

| COMPONENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | rs:                            |                                       | ORIGINAL                                                     | MEASUREMENTS:                     |                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------|--------------------------------------------------------------|-----------------------------------|-------------------------------------------|
| (1) H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | lelium: He <sup>4</sup> :      | 7440-59-7                             | Hiza.                                                        | M. J. Nat.                        | Bur, Standards,                           |
| (2) $p_{-}p_{0} = p_{0} = p_{$ |                                | Tech. Note, 621, 1972.                |                                                              |                                   |                                           |
| (2) 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -Deuterium;                    | n-D <sub>2</sub> ; 7782-39-0          |                                                              |                                   |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       |                                                              |                                   |                                           |
| VARIABLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5:                             |                                       | PREPARED                                                     | BY:                               |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       |                                                              |                                   |                                           |
| Temper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ature, press                   | ure                                   | С. Ц.                                                        | Young                             |                                           |
| EXPERIMEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NTAL VALUES:                   |                                       |                                                              |                                   |                                           |
| т/к                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Mole<br>P/bar                  | fraction of helium in liquid,         | т/к                                                          | Mole<br>P/bar                     | fraction of helium in liquid.             |
| -,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -,                             | 2a,<br>x<br>Ho <sup>4</sup>           | -,                                                           | -,                                | и                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                | не                                    |                                                              |                                   |                                           |
| 20.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.2945                         | 0.0000                                | 26.00                                                        | 12.069                            | 0.0182                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 9.846<br>13.420                | 0.0085(5)<br>0.0092(6)                |                                                              | 13.983<br>17.375                  | 0.0200                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 16.941                         | 0.0099(7)                             |                                                              | 19.664                            | 0.0252                                    |
| 22.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.6082                         | 0.0000                                | 28.00                                                        | 20.154 2.9820                     | 0.0247                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8.515<br>10 363                | 0.0099(2)                             |                                                              | 6.805                             | 0.0103                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 14.093                         | 0.0133                                |                                                              | 10.294                            | 0.0148                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 17.285                         | 0.0136<br>0.0154                      |                                                              | 15.461<br>18.795                  | 0.0236<br>0.0278                          |
| 24.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.1204                         | 0.00000                               |                                                              | 19.153                            | 0.0277                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10.639                         | 0.0126                                | 30.00                                                        | 4.4678                            | 0.0292                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13.841                         | 0.0157                                |                                                              | 8.943                             | 0.0136                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.257                         | 0.0200                                |                                                              | 14.210                            | 0.0249                                    |
| 26.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.8892<br>8.643                | 0.00000<br>0.0146                     |                                                              | 16.493<br>20.670                  | 0.0290                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 9.329                          | 0.0142                                |                                                              | 20.684                            | 0.0341                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       |                                                              |                                   | (cont.)                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       |                                                              |                                   |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                | AUXILIARY                             | INFORMATI                                                    | ON                                |                                           |
| METHOD /APPARATUS/PROCEDURE:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |                                       | SOURCE AN                                                    | ND PURITY OF MAT                  | TERIALS:                                  |
| Recirculating vapor flow apparatus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |                                       | <ol> <li>Nat. Bureau of Mines A grade<br/>sample.</li> </ol> |                                   |                                           |
| circul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ating pump de                  | scribed in ref. 1.                    | 2. USAEC sample 1.12% HD and 0.02%                           |                                   |                                           |
| Tempera<br>resista                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ature measure<br>ance thermome | ed with platinum<br>eter and pressure | H 2 •                                                        |                                   |                                           |
| measur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed with a dou                  | ble revolution                        |                                                              |                                   |                                           |
| liquid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | analysed by                    | gas chromatography                    |                                                              |                                   |                                           |
| using detecto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | thermistor th                  | ermal conductivity                    |                                                              |                                   |                                           |
| ref. 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | •                              | 5 In Source and                       |                                                              |                                   |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | ESTIMATE                                                     | ERROR:                            |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | δT/K =                                                       | ±0.01; δP/b                       | $ar = \pm 0.004;$                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | <sup>δ x</sup> He <sup>4</sup> ′                             | $\delta y_{\text{He}^4} = \pm 38$ | or 0.001 whichever<br>is greater.         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | DEPENDENC                                                    |                                   |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | REFERENCI                                                    | LD:                               |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | . H128<br>Rev.                                               | Sci. Instr.                       | , <u>1969</u> , <i>40</i> , 513.          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | 2. Dung                                                      | can, A. G. an                     | d Hiza, M. J.,                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       | Ααυ.                                                         | . cryog. Engn                     | <i>y</i> ., <u>1970</u> , <i>1</i> 3, 42. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                                       |                                                              |                                   |                                           |

ORIGINAL MEASUREMENTS: COMPONENTS: Hiza, M. J., Nat. Bur. Standards, Helium; He<sup>4</sup>; 7440-59-7 (1) Tech Note 621, 1972. (2) n-Deuterium; n-D<sub>2</sub>; 7782-39-0 EXPERIMENTAL VALUES: Mole fraction of helium т/к P/bar in vapor, <sup>y</sup>He<sup>4</sup> 20.00 6.832 0.9397(1) 0.9542(5) 10.042 0.9607(8) 13.696 18.254 0.9651(1)24.00 4.037 0.6857 0.8240 8.453 14.221 20.439 0.8783 0.8995 28.00 8.098 0.5564 10.642 0.6312 0.7116 15.744 19.281 7.243 0.7477 0.2095 30.00 10.556 0.4665 15.431 0.5873 20.274 0.6444

| COMPONENTS:                                                    | ORIGINAL MEASUREMENTS:                                                    | | | |
|---|---|---|---|---|
| (l) Helium; He; 7440-59-7                                      | Cannon, W. A. and Crane, W. E.,<br>Cryogenic Tech., <u>1968</u> , 4, 178. |
| (2) Fluorine; F <sub>2</sub> ; 7782-41-4                       |                                                                           |
|                                                                |                                                                           |
|                                                                |                                                                           |
| VARIABLES:                                                     | PREPARED BY:                                                              |
| Temperature, pressure                                          | C. L. Young                                                               |
|                                                                |                                                                           |
| EXPERIMENTAL VALUES:                                           |                                                                           |
| Mole fraction of<br>helium in liquid<br>phase, x <sub>He</sub> | I                                                                         |
| ·····                                                          |                                                                           |
| 77 4.5 0.0002                                                  |                                                                           |
| 77 18.3 0.0007<br>77 35.5 0.0013                               |                                                                           |
| 120 20.8 0.0016                                                |                                                                           |
| 120 31.2 0.0059                                                |                                                                           |
|                                                                |                                                                           |
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|                                                                |                                                                           |
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|                                                                |                                                                           |
|                                                                |                                                                           |
| AUXILIARY                                                      | INFORMATION                                                               |
| METHOD /APPARATUS/ PROCEDURE:                                  | SOURCE AND PURITY OF MATERIALS:                                           |
| System equilibrated in stainless steel                         | 1. Dry sample, purity 99.8 mole per                                       |
| ly agitated). Samples of liquid                                | 2. Sample purity 98.5 mole per cent                                       |
| phase analysed by mass spectrometry.                           | passed through sodium fluoride                                            |
| Details in source.                                             | fluoride.                                                                 |
|                                                                |                                                                           |
|                                                                |                                                                           |
|                                                                |                                                                           |
|                                                                | COTHATED EDDAD.                                                           |
|                                                                | $\delta T/K = \pm 0.2;  \delta P/bar = \pm 0.3;$                          |
|                                                                | $\delta x_{\rm He} = \pm 0.0001$ (estimated by compiler)                  |
|                                                                | REFERENCES:                                                               |
|                                                                |                                                                           |
|                                                                |                                                                           |
|                                                                |                                                                           |
|                                                                |                                                                           |
|                                                                |                                                                           |
| COMPONENTS: |           |                   |            | EVALUATOR:                                                                                  |
|-------------|-----------|-------------------|------------|---------------------------------------------------------------------------------------------|
| 1.          | Helium-3; | He <sup>3</sup> ; | 14762-55-1 | Colin Young,                                                                                |
| 2.          | Hydrogen; | H <sub>2</sub> ;  | 1333-74-0  | School of Chemistry,<br>University of Melbourne,<br>Parkville, Victoria 3052,<br>AUSTRALIA. |

There are two sets of data reported for this system. Matyash, Mank and Starkov (2) report one isotherm at 20.4 K up to 9.3 bar and a few points at higher and lower temperatures to indicate the temperature dependence. Hiza (1) has reported a more detailed study at 22.00 K to 28.00 K up to pressures of 15.4 bar. There is some discrepancy between the values of Matyash *et al.* (2) and those extrapolated to the same temperature using Hiza's data. Matyash *et al.*'s mole fraction of helium in the liquid phase is consistently lower than Hiza's extrapolated data particularly at lower pressures.

It is difficult to classify these data as both appear to be of high precision but in view of the accuracy of other studies by Hiza in the same publication (1) we classify Hiza's data as tentative and Matyash et al.'s (2) data as doubtful.

1. Hiza, M. J., Nat. Bur. Standards Techn. Note 621, 1972.

 Matyash, I. V., Mank, V. V. and Starkov, M. G., Ukr. Fiz. Zh., <u>1966</u>, 11, 497.

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COMPONENTS:
                                             ORIGINAL MEASUREMENTS:
 1. Helium-3; He<sup>3</sup>; 14762-55-1
                                             Matyash, I. V., Mank, V. V. and
                                              Starkov, M. G., Ukran. Fiz. Zhur.,
 2. Hydrogen; H<sub>2</sub>; 1333-74-0
                                             1966, 11, 497.
VARIABLES:
                                             PREPARED BY:
 Temperature, pressure
                                             C. L. Young
EXPERIMENTAL VALUES:
                         Mole fraction of helium-3
 т/к
            P/bar
                               in liquid, x_{\text{He}^3}
 17.2
              5.7
                                  0.0039
              7.4
                                  0.0041
 19.0
              4.3
                                  0.0036
              6.1
                                  0.0059
                                  0.0072
              8.1
 20.4
              2.0
                                  0.0019
              3.6
                                  0.0041
              4.3
                                  0.0051
              4.9
                                  0.0053
              8.1
                                  0.0092
              9.3
                                  0.0103
 23.0
              4.9
                                 0.0065
 24.0
              4.9
                                  0.0082
                                   AUXILIARY INFORMATION
METHOD :
                                             SOURCE AND PURITY OF MATERIALS:
Helium in liquid estimated by
                                                      No details given.
measuring nuclear magnetic resonance
absorption.
                                             ESTIMATED ERROR:
                                             \delta T/K = \pm 0.1; \quad \delta P/bar = \pm 0.1;
                                             \delta x_{\text{He}} = \pm 0.0003 (estimated by compiler)
                                             REFERENCES:
```

| COMPONENTS:                                                                      | ORIGINAL MEASUREMENTS:                                                                          |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| (1) Helium; He <sup>3</sup> ; 14762-55-1                                         | Hiza, M. J., Nat. Bur. Standards<br>Tech. Note 621, 1972.                                       |
| (2) n-Hydrogen; n-H <sub>2</sub> ; 1333-74-0                                     |                                                                                                 |
|                                                                                  |                                                                                                 |
| VARIABLES:                                                                       | PREPARED BY:                                                                                    |
| Temperature, pressure .                                                          | C. L. Young                                                                                     |
|                                                                                  |                                                                                                 |
| EXPERIMENTAL VALUES:                                                             |                                                                                                 |
| Mole fraction of<br>T/K P/bar helium in liquid,<br><sup>27</sup> He <sup>3</sup> |                                                                                                 |
| 22.00 1.5824 0.0000                                                              |                                                                                                 |
| 8.298 0.0123<br>10.601 0.0151                                                    |                                                                                                 |
| 13.724 0.0201<br>15.134 0.0215                                                   |                                                                                                 |
| 24.00 2.565 0.0000                                                               |                                                                                                 |
| 10.374 0.0176                                                                    |                                                                                                 |
| 12.790 0.0221<br>14.979 0.0285                                                   |                                                                                                 |
| 26.00 3.9334 0.0000                                                              |                                                                                                 |
| 10.435 0.0178                                                                    |                                                                                                 |
| 13.621 0.0285<br>15.375 0.0331                                                   |                                                                                                 |
| 28.00 5.7295 0.0000<br>9.301 0.0148                                              |                                                                                                 |
| 11.700 0.0227                                                                    |                                                                                                 |
| 15.406 0.0368                                                                    |                                                                                                 |
|                                                                                  |                                                                                                 |
|                                                                                  |                                                                                                 |
|                                                                                  |                                                                                                 |
| AUXILIARY                                                                        | INFORMATION                                                                                     |
|                                                                                  | SOURCE AND PURITY OF MATERIALS.                                                                 |
| Recirculating vapor flow apparatus.                                              | 1. USEAC sample containing 1.4 mole-%                                                           |
| Copper equilibrium cell. Recircula-                                              | He <sup>4</sup> .                                                                               |
| perature measured with platinum resis-                                           | several months.                                                                                 |
| tance thermometer and pressure measu-<br>red with a double-revolution Bourdon    |                                                                                                 |
| gauge. Samples of gas and liquid                                                 |                                                                                                 |
| thermistor thermal conductivity de-                                              |                                                                                                 |
| tectors. Details in source and ref.                                              |                                                                                                 |
|                                                                                  |                                                                                                 |
|                                                                                  | $\delta T/K = \pm 0.01;  \delta P/bar = \pm 0.004;$                                             |
|                                                                                  | $\delta x_{\rm He^3} = \pm 0.001.$                                                              |
|                                                                                  | REFERENCES:                                                                                     |
|                                                                                  | <ol> <li>Hiza, M. J. and Duncan, A. G.,<br/>Rev. Sci. Inst., 1969, 40, 513.</li> </ol>          |
|                                                                                  | <ol> <li>Duncan, A. G. and Hiza, M. J.,<br/>Adv. Cryog. Engng., <u>1970</u>, 15, 42.</li> </ol> |
|                                                                                  |                                                                                                 |

| COMPONENTS: |           |                   |           | EVALUATOR:                |  |  |  |
|-------------|-----------|-------------------|-----------|---------------------------|--|--|--|
| 1.          | Helium-4; | He <sup>4</sup> ; | 7440-59-7 | Colin Young,              |  |  |  |
|             |           |                   |           | School of Chemistry,      |  |  |  |
| 2.          | Hydrogen; | H <sub>2</sub> ;  | 1333-74-0 | University of Melbourne,  |  |  |  |
|             |           |                   |           | Parkville, Victoria 3052, |  |  |  |
|             |           |                   |           | AUSTRALIA.                |  |  |  |

There are five sets of data on this system but no two sets are in complete accord. The unpublished data by Smith (1) at 17.4 K, 20.4 K and 21.7 K are consistent within a few percent of those of Streett *et al.* (2) only at 20.4 K. Smith's (1) data at 21.7 K appear quite erratic and there is a discrepancy of 30-50 percent between the data of Streett *et al.* (2) and those of Smith (1) at 17.4 K. Smith's data are therefore rejected.

The helium-4 + normal hydrogen data of Streett *et al.* (2), Sneed *et al.* (3) and the helium-4 + para hydrogen data of Sonntag *et al.* (4) are broadly consistent with the data of Hiza (5). However there appears to be some discrepancies of up to 20 percent in the mole fraction of helium in the liquid phase in the lower pressure range (below 10 bar). The consistency of the data of Streett *et al.* (2), Sneed *et al.* (3) and Sonntag *et al.* (4) should not be over-emphasised since the apparatus was essentially the same and all compositions were estimated by mass spectrometry in all three studies. The data of Streett *et al.* (2), Sneed *et al.* (3) Sonntag *et al.* (4) and Hiza (5) are all classified as tentative.

The only other data are those of Roellig and Giese (6) which are of lower precision than and not completely consistent with those measurements discussed in the previous paragraph and are therefore classified as doubtful.

#### References

- 1. Smith, S. R., Ph.D. Thesis, Ohio State University, Columbus, <u>1952</u>.
- Streett, W. B., Sonntag, R. E. and Van Wylen, G. J., J. Chem. Phys., 1964, 40, 1390.
- Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., J. Chem. Phys., <u>1968</u>, 49, 2410.
- Sonntag, R. E., Van Wylen, G. J. and Crain, R. W., J. Chem. Phys., <u>1964</u>, 41, 2399.
- 5. Hiza, M. J., Nat. Bur. Standards Techn. Note 621, 1972.
- 6. Roellig, L. O. and Giese, C., J. Chem. Phys., <u>1962</u>, 37, 114.

| COMDONENTS .                                                                                                                                                                                                                                                                                                                                                                                        |                                        |  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--|--|--|--|--|
| CONFORMIS.                                                                                                                                                                                                                                                                                                                                                                                          | OKIGINAL MEASUREMENTS.                 |  |  |  |  |  |
| (1) Helium; He; 7440-59-7                                                                                                                                                                                                                                                                                                                                                                           | Roellig, L. O. and Giese, L.,          |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | J. Chem. Phys., <u>1962</u> , 37, 114. |  |  |  |  |  |
| (2) Hydrogen; H <sub>2</sub> ; 1333-74-0                                                                                                                                                                                                                                                                                                                                                            |                                        |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |  |  |  |  |  |
| VARIABLES:                                                                                                                                                                                                                                                                                                                                                                                          | PREPARED BY:                           |  |  |  |  |  |
| Temperature, pressure                                                                                                                                                                                                                                                                                                                                                                               | C. L. Young                            |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | _                                      |  |  |  |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                                                                                                                                                                |                                        |  |  |  |  |  |
| $10^{2}$ Mol                                                                                                                                                                                                                                                                                                                                                                                        | e fraction of helium                   |  |  |  |  |  |
| T/K $P'/bar$ 10 $Hor$                                                                                                                                                                                                                                                                                                                                                                               | in liquid, x <sub>He</sub>             |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |  |  |  |  |  |
| 16.3±0.2 1.88±0.07                                                                                                                                                                                                                                                                                                                                                                                  | 1.26±0.32                              |  |  |  |  |  |
| 17.7±0.3 3.82±0.19                                                                                                                                                                                                                                                                                                                                                                                  | 3.80±0.52                              |  |  |  |  |  |
| $19.8\pm0.5$ 7.10±0.20                                                                                                                                                                                                                                                                                                                                                                              | 11.05±0.50                             |  |  |  |  |  |
| 20.710.5 $1.7910.1921.6+0.5$ $3.72+0.18$                                                                                                                                                                                                                                                                                                                                                            | 3 01+0 61                              |  |  |  |  |  |
| 22.3±0.4 7.74±0.18                                                                                                                                                                                                                                                                                                                                                                                  | 8.35±0.74                              |  |  |  |  |  |
| 26.8±0.2 2.01±0.15                                                                                                                                                                                                                                                                                                                                                                                  | 0.59±0.06                              |  |  |  |  |  |
| 27.3±0.3 4.38±0.26                                                                                                                                                                                                                                                                                                                                                                                  | 1.03±0.10                              |  |  |  |  |  |
| 28.610.3 6.5910.40                                                                                                                                                                                                                                                                                                                                                                                  | 2.89±0.27                              |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | ΙΝΕΟΡΜΑΤΙΟΝ                            |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |  |  |  |  |  |
| METHOD / APPARATUS / PROCEDURE:                                                                                                                                                                                                                                                                                                                                                                     | SOURCE AND PURITY OF MATERIALS:        |  |  |  |  |  |
| Static glass equilibrium cell fitted<br>with stirrer and vapor and liquid<br>sampling values. Partial pressure<br>of helium determined from analysis of<br>vapor phase and pressure measured with<br>Bourdon gauge. Liquid sample compo-<br>sition determined from knowledge of<br>total amounts of helium and hydrogen<br>in cell and composition of vapor or<br>mass spectral analysis of liquid. | No details given.                      |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | ESTIMATED ERROR:                       |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | As denoted in experimental values.     |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | -                                      |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                   |                                        |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | DEFEDENCES .                           |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | REFERENCES :                           |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | REFERENCES :                           |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | REFERENCES :                           |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | REFERENCES :                           |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | REFERENCES :                           |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                     | REFERENCES :                           |  |  |  |  |  |

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| COMPONENTS :                                                                                  |                                                      |                                                                        |                                                                                                                  | ORIGINAL MEASUREMENTS:                                                                              |                                                        |                                                             |                                                             |  |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|--|
| <ul> <li>(1) Helium; He; 7440-59-7</li> <li>(2) Hydrogen; H<sub>2</sub>; 1333-74-0</li> </ul> |                                                      |                                                                        | Sneed, C. M., Sonntag, R. E. and<br>Van Wylen, G. J., <i>J. Chem. Phys.</i> ,<br><u>1968</u> , <i>49</i> , 2410. |                                                                                                     |                                                        |                                                             |                                                             |  |
| VARIABLES:                                                                                    |                                                      |                                                                        |                                                                                                                  | PREPARED BY:                                                                                        |                                                        |                                                             |                                                             |  |
| Temperature, pressure                                                                         |                                                      |                                                                        | с. г.                                                                                                            | Young                                                                                               |                                                        |                                                             |                                                             |  |
| EXPERIM                                                                                       | ENTAL VALU                                           | ES:                                                                    |                                                                                                                  |                                                                                                     |                                                        |                                                             |                                                             |  |
| T/K                                                                                           | P/bar                                                | Mole fraction<br>in liquid,<br><sup>x</sup> He                         | of helium<br>in vapor<br><sup>y</sup> He                                                                         | ,Т/К                                                                                                | P/bar                                                  | Mole fraction<br>in liquid,<br><sup>x</sup> He              | of helium<br>in vapor,<br><sup>y</sup> He                   |  |
| 15.50                                                                                         | 26.6<br>34.5<br>41.4<br>51.8<br>52.5<br>29.0<br>41.3 | 0.0095<br>0.0112<br>0.0113<br>0.0118<br>0.0120<br>0.0157<br>0.0166     | 0.971<br>0.970<br>0.973<br>0.975<br>0.974<br>0.951<br>0.957                                                      | 26.00<br>27.80                                                                                      | 103.4<br>23.6<br>34.5<br>51.6<br>65.5<br>82.7<br>88.1  | 0.144<br>0.066<br>0.102<br>0.166<br>0.205<br>0.242<br>0.253 | 0.736<br>0.530<br>0.558<br>0.567<br>0.556<br>0.543<br>0.543 |  |
| 20.40                                                                                         | 51.7<br>65.4<br>82.8<br>34.5<br>41.4<br>51.8<br>65.5 | 0.0182<br>0.0189<br>0.0196<br>0.0335<br>0.0356<br>0.0405<br>0.0432     | 0.960<br>0.962<br>0.966<br>0.897<br>0.902<br>0.903<br>0.912                                                      | 28.05                                                                                               | 91.1<br>92.9<br>103.6<br>70.3<br>90.1<br>97.3<br>103.4 | 0.260<br>0.257<br>0.264<br>0.255<br>0.297<br>0.314<br>0.328 | 0.556<br>0.561<br>0.576<br>0.504<br>0.497<br>0.509<br>0.517 |  |
| 23.00                                                                                         | 82.8<br>103.4<br>41.4<br>51.6<br>65.5<br>82.7        | 0.0431<br>0.0450<br>0.058<br>0.065<br>0.071<br>0.076                   | 0.920<br>0.927<br>0.824<br>0.828<br>0.837<br>0.851                                                               | 28.20<br>28.45                                                                                      | 58.6<br>68.7<br>70.8<br>72.7<br>78.5<br>42.9           | 0.212<br>0.264<br>0.269<br>0.279<br>0.321<br>0.150          | 0.521<br>0.486<br>0.475<br>0.477<br>0.441<br>0.515          |  |
| 26.00                                                                                         | 41.3<br>52.1<br>65.5<br>82.9                         | 0.092<br>0.111<br>0.138<br>0.157                                       | 0.688<br>0.695<br>0.705<br>0.716                                                                                 |                                                                                                     | 59.6<br>63.2<br>64.9<br>66.7                           | 0.191<br>0.252<br>0.276<br>0.297<br>0.363                   | 0.496<br>0.474<br>0.441<br>0.416<br>0.376                   |  |
|                                                                                               |                                                      |                                                                        | AUXILIARY                                                                                                        | INFORMAT                                                                                            | ION                                                    |                                                             |                                                             |  |
| METHOD                                                                                        | /APPARAT                                             | US/PROCEDURE:                                                          |                                                                                                                  | SOURCE AND PURITY OF MATERIALS:                                                                     |                                                        |                                                             |                                                             |  |
| Recirc<br>with ma<br>ture.<br>spectro                                                         | ulating<br>agnetic<br>Sample:<br>ometrv.             | vapor flow appa<br>pump at ambient<br>s analysed by m<br>Temperature m | aratus<br>: tempera-<br>ass<br>easured                                                                           | <ol> <li>Bureau of Mines high purity<br/>sample.</li> <li>Mathematical Number of Sample.</li> </ol> |                                                        |                                                             |                                                             |  |
| with p<br>Pressu<br>Detail                                                                    | latinum :<br>re measu:<br>s in sou:                  | resistance ther<br>red using Bourd<br>rce.                             | mometer.<br>lon gauge.                                                                                           |                                                                                                     |                                                        |                                                             |                                                             |  |
|                                                                                               |                                                      |                                                                        |                                                                                                                  | ESTIMATH<br>$\delta T/K =$<br>$\delta x_{He} =$<br>$\pm 0.001$                                      | ED ERROR:<br>= ±0.01;<br>= ±0.003                      | $\delta P/bar = \pm 0$<br>or less; $\delta y_{\rm H}$       | .1;<br>He =                                                 |  |
|                                                                                               |                                                      |                                                                        |                                                                                                                  | REFEREN                                                                                             | CES:                                                   |                                                             |                                                             |  |

| COMP                                                                        | COMPONENTS:                          |                                                |                                           |                                     | ORIGINAL MEASUREMENTS:               |                                                |                                           |  |
|-----------------------------------------------------------------------------|--------------------------------------|------------------------------------------------|-------------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|-------------------------------------------|--|
| <pre>(1) Helium; He; 7440-59-7 (2) Hydrogen; H<sub>2</sub>; 1333-74-0</pre> |                                      |                                                |                                           | Sneed,<br>Van Wy<br><u>1968</u> , 4 | C. M.,<br>len, G.<br>49, 2410        | Sonntag, R. E.<br>J., J. Chem. P               | and<br>hys.,                              |  |
| EXPE                                                                        | RIMENTAL V                           | ALUES:                                         |                                           |                                     |                                      |                                                |                                           |  |
| т/к                                                                         | P/bar                                | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He | т/к                                 | <i>P/</i> bar                        | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He |  |
| 29.00                                                                       | 29.8<br>36.3<br>41.4<br>51.7<br>52.0 | 0.098<br>0.133<br>0.165<br>0.268<br>0.277      | 0.457<br>0.469<br>0.465<br>0.380<br>0.365 | 29.80                               | 28.4<br>34.5<br>38.6<br>40.1<br>40.3 | 0.107<br>0.156<br>0.195<br>0.232<br>0.248      | 0.387<br>0.390<br>0.358<br>0.327<br>0.317 |  |

| COMPONENTS:          |                       |                           |                       | ORIGINAL MEASUREMENTS:               |                               |                             |                       |
|----------------------|-----------------------|---------------------------|-----------------------|--------------------------------------|-------------------------------|-----------------------------|-----------------------|
| (1) He               | lium:                 | He: 7440-59-7             |                       | Sonntag, R. E., Van Wylen, G. J. and |                               |                             |                       |
| (2) 11.              | ,                     | T . 1999.74               | 0                     | Crain, R. W., J. Chem. Phys., 1964,  |                               |                             |                       |
| (2) ну               | arogen;               | H <sub>2</sub> ; 1333-/4- | -0                    | 41, 2399.                            |                               |                             |                       |
|                      |                       |                           |                       | -                                    |                               |                             |                       |
|                      |                       |                           |                       |                                      |                               |                             |                       |
| VARIABLES:           |                       |                           | PREPARED BY:          |                                      |                               |                             |                       |
| Tempera              | ture, p               | ressure                   |                       | с. г. у                              | loung                         |                             |                       |
|                      | Temperature, pressure |                           |                       |                                      | <b>,</b>                      |                             |                       |
| EXPERIMENTAL VALUES: |                       |                           |                       |                                      |                               |                             |                       |
| - /                  | <b>D</b> (1           | Mole fraction             | of helium             | 1<br>                                | <b>D</b> (1                   | Mole fraction               | of helium             |
| Т/К                  | P/bar                 | in liquid,<br><i>x</i>    | in vapor,             | т/к                                  | P/bar                         | in liquid,                  | in vapor,<br><i>u</i> |
|                      |                       | Не                        | ене                   |                                      |                               | Не                          | •не                   |
| 20.40                | 2.39                  | 0.0023                    | 0.4940                | 23.00                                | 34.47                         | 0.0562                      | 0.8250                |
|                      | 5.40                  | 0.0060                    | 0.7280                | 20.00                                | 10.34                         | 0.0200                      | 0.4557                |
|                      | 6.89                  | 0.0087                    | 0.7821                |                                      | 13.79                         | 0.0303                      | 0.5355                |
|                      | 8.62                  | 0.0102                    | 0.8083                |                                      | 17.24                         | 0.0367                      | 0.5877                |
|                      | 12.07                 | 0.0117                    | 0.8471                |                                      | 20.68                         | 0.0508                      | 0.6300                |
|                      | 13.79                 | 0.0177                    | 0.8579                |                                      | 27.58                         | 0.0595                      | 0.6651                |
|                      | 17.24                 | 0.0192                    | -                     |                                      | 27.58                         | 0.0637                      | 0.6505                |
|                      | 20.68                 | 0.0204                    | 0.8680                |                                      | 34.47                         | 0.0810                      | 0.6804                |
|                      | 27.58                 | 0.0266                    | 0.8872                | 29.00                                | 9.79                          | 0.0.9                       | 0.1760                |
|                      | 27.58                 | 0.0294                    | 0.8856                |                                      | 12.03                         | 0.0222                      | 0.2615                |
|                      | 34.47                 | 0.0316                    | 0.8599                |                                      | 17.34                         | 0.0478                      | 0.3790                |
| 23.00                | 4.45                  | 0.0054                    | 0.4560                |                                      | 20.72                         | 0.0633                      | 0.4190                |
|                      | 5.17                  | 0.0065                    | 0.5220                |                                      | 27.61                         | 0.1006                      | 0.4600                |
|                      | 6.96<br>8.62          | 0.0105                    | 0.6170                | 31.00                                | 34.54                         | 0.0217                      | 0.1317                |
|                      | 10.38                 | 0.0175                    | 0.7090                | 01.00                                | 17.13                         | 0.0440                      | 0.2010                |
|                      | 12.07                 | 0.0227                    | 0.7350                |                                      | 17.24                         | 0.0455                      | -                     |
| 1                    | 17.24                 | 0.0240                    | 0.7790                |                                      | 20.68                         | 0.0908                      | 0.2314                |
|                      | 20.68                 | 0.0365                    | 0.7950                |                                      | 22.89                         | -                           | 0.2368                |
|                      | 27.58                 | 0.0473                    | 0.7910                |                                      | 24.13                         | -                           | 0.2394                |
|                      |                       |                           | AUXILIARY             | INFORMATI                            | ON                            |                             |                       |
| METHOD/A             | PPARATU               | S/PROCEDURE:              |                       | SOURCE AN                            | D PURITY                      | OF MATERIALS:               |                       |
| Recircu              | lating                | vapor flow app            | aratus                | l. No d                              | letails                       | given.                      |                       |
| ture.                | gnetic j<br>Sample    | s analysed by t           | t tempera-<br>thermal | 2. Hydr                              | ogen co                       | ntained approx              | ximately              |
| conduct              | ivity.                | Temperature i             | measured              | 0.21                                 | .% ortho                      | -H <sub>2</sub> , 99.79% ра | ara-H <sub>2</sub> .  |
| with pl              | atinum                | resistance the            | rmometer.             |                                      |                               |                             | ļ                     |
| Pressur              | e measu:<br>in ref    | red with Bourdo           | on gauge.             |                                      |                               |                             |                       |
| Decuiis              | 111 1 1 1 1           |                           |                       |                                      |                               |                             |                       |
|                      |                       |                           |                       |                                      |                               |                             |                       |
|                      |                       |                           |                       |                                      |                               |                             |                       |
|                      |                       |                           |                       |                                      |                               |                             |                       |
|                      |                       |                           |                       | ESTIMATE                             | ERROR:                        |                             |                       |
|                      |                       |                           | δТ/К =                | ±0.005;                              | $\delta P/\text{bar} = \pm 0$ | .03;                        |                       |
|                      |                       |                           |                       | δx <sub>He</sub> , δ                 | $y_{\text{He}} = \pm$         | 0.001.                      | ,                     |
|                      |                       |                           |                       | REFERENCE                            | ES:                           |                             |                       |
|                      |                       |                           |                       | l. Str                               | eett, W                       | . B., Cryogent              | ics, <u>1965</u> ,    |
|                      |                       |                           |                       | 5,                                   | 27.                           |                             |                       |
|                      |                       |                           |                       |                                      |                               | ,                           |                       |
|                      |                       |                           |                       |                                      |                               |                             | 1                     |

| COMPONENTS:<br>(1) Helium; He; 7440-59-7<br>(2) Hydrogen; H <sub>2</sub> ; 1333-74-0                                 |                                           |                                      |                                                | ORIGINA<br>Sonntag<br>Crain,<br>41, 239 | L MEASU<br>, R. E<br>R. W.,<br>99.                    | UREMENTS:<br>., Van Wylen, G<br>J. Chem. Phys | G. J. and<br>., <u>1964</u> ,                  |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------|------------------------------------------------|-----------------------------------------|-------------------------------------------------------|-----------------------------------------------|------------------------------------------------|
| EXPERIMENTAL VALUES:<br>Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br><sup>x</sup> He <sup>y</sup> He |                                           |                                      | т/к                                            | P/bar                                   | Mole fraction<br>in liquid,<br><sup><i>x</i></sup> He | of helium<br>in vapor,<br><sup>y</sup> He     |                                                |
| 31.00<br>31.50                                                                                                       | 25.27<br>26.92<br>12.17<br>14.00<br>15.51 | 0.1255<br>0.1812<br>0.0107<br>0.0239 | 0.2353<br>0.1844<br>0.0634<br>0.1099<br>0.1402 | 31.50                                   | 17.24<br>18.96<br>20.68<br>21.72<br>22.89             | 0.0455<br>0.0808<br>0.0928<br>0.1490          | 0.1568<br>0.1697<br>0.1713<br>0.1870<br>0.1657 |

| COMPONEN | ITS:         |                        |                 | ORIGINAL MEASUREMENTS:             |           |                             |                  |  |
|----------|--------------|------------------------|-----------------|------------------------------------|-----------|-----------------------------|------------------|--|
| (1) H    | elium;       | He; 7440-59            | -7              | Streett, W. B., Sonntag, R. E. and |           |                             |                  |  |
| ,        |              |                        | -               | Van Wylen, G. J., J. Chem. Phys.   |           |                             |                  |  |
| (2) H    | ydrogen;     | H <sub>2</sub> ; 1333- | 74-0            | 1064 40 1200                       |           |                             |                  |  |
| ł        |              |                        |                 | <u>1964</u> ,                      | 40, 1390  | υ.                          |                  |  |
| ļ        |              |                        |                 |                                    |           |                             |                  |  |
|          |              |                        |                 |                                    |           |                             |                  |  |
| VARIABLI | ES:          |                        |                 | PREPARED                           | BY:       |                             |                  |  |
| Temper   | ature, p     | ressure                |                 | с. г.                              | Young     |                             |                  |  |
|          |              |                        |                 | -                                  |           |                             |                  |  |
| 1        |              |                        |                 |                                    |           |                             |                  |  |
| EXPERIME | ENTAL VALI   | JES:                   |                 |                                    |           |                             |                  |  |
| m /17    |              | Mole fractio           | n of helium     | m /17                              | D /h a m  | Mole fraction               | n of helium      |  |
| TYK      | P/bar        | in liquid,             | in vapor,       | TYK                                | P/bar     | in liquid,                  | in vapor,        |  |
|          |              | "Не                    | <sup>9</sup> He |                                    |           | "Не                         | <sup>9</sup> He  |  |
| 15.50    | 3.41         | _                      | 0.9378          | 20.40                              | 12.07     | 0.0154                      | 0.8603           |  |
|          | 5.17         | 0.0029                 | 0.9551          |                                    | 13.79     | 0.0167                      | 0.8713           |  |
|          | 6.89         | 0.0046                 | 0.9631          |                                    | 17.24     | 0.0205                      | 0.8841           |  |
|          | 8.62         | 0.0051                 | 0.9677          |                                    | 20.68     | 0.0236                      | 0.8897           |  |
| l        | 10.34        | 0.0055                 | 0.9/02          |                                    | 21.58     | 0.0296                      | 0.9008           |  |
|          | 13.79        | 0.0071                 | 0.9729          | 23.00                              | 3.45      | 0.0038                      | 0.3700           |  |
| Í .      | 17.24        | 0.0082                 | 0.9741          | 23.00                              | 5.17      | 0.0075                      | 0.5344           |  |
|          | 20.68        | 0.0087                 | 0.9748          |                                    | 6.89      | 0.0115                      | 0.6290           |  |
| 17.07    | 3.90         | 0.0036                 | 0.8967          |                                    | 8.62      | 0.0136                      | 0.6787           |  |
|          | 5.17         | 0.0043                 | 0.9186          |                                    | 10.34     | 0.0172                      | 0.9828           |  |
|          | 8.62         | 0.0072                 | 0.9412          |                                    | 13.79     | 0.0239                      | 0.9761           |  |
| Í        | 10.34        | 0.0080                 | 0.9464          |                                    | 17.24     | 0.0291                      | 0.9709           |  |
|          | 12.07        | 0.0089                 | 0.9503          |                                    | 20.68     | 0.0355                      | 0.9645           |  |
| 1        | 13.79        | 0.0100                 | 0.9515          |                                    | 27.58     | 0.0458                      | 0.9542           |  |
|          | 17.24        |                        | 0.9556          | 26 00                              | 34.47     | 0.0546                      | 0.9454           |  |
| 1        | 20.00        | 0.0151                 | 0.9582          | 20.00                              | 5.50      | 0.0087                      | 0.9903           |  |
| 20.40    | 2.41         | 0.0034                 | 0.5360          |                                    | 8.62      | 0.0143                      | 0.9857           |  |
|          | 3.45         | 0.0041                 | 0.6545          |                                    | 10.34     | 0.0192                      | 0.9808           |  |
|          | 5.17         | 0.0061                 | 0.7540          |                                    | 13.79     | 0.0286                      | 0.9714           |  |
|          | 6.89<br>8.62 | 0.0084                 | 0.8030          |                                    | 20 68     | 0.0364                      | 0.9636           |  |
|          | 10.34        | 0.0130                 | 0.8480          |                                    | 27.58     | 0.0664                      | 0.9336           |  |
| <u> </u> |              |                        |                 |                                    |           |                             | · <u></u>        |  |
|          |              |                        | AUXILIARY       | INFORMAT                           | ION       |                             |                  |  |
| METHOD / | APPARAT      | US/PROCEDURE           | •               | SOURCE A                           | AND PURIT | Y OF MATERIALS:             |                  |  |
| Details  | s of app     | aratus given           | in ref. 1.      |                                    |           |                             |                  |  |
| Recircu  | ulating      | vapor flow a           | pparatus        |                                    | No det    | ails given.                 | 1                |  |
| with ma  | agnetic      | pump at ambi           | ent tempera-    |                                    |           |                             |                  |  |
| ture.    | Sample       | s of coexist           | ing phases      |                                    |           |                             |                  |  |
| anaryse  | ea by ma     | ss spectrome           | LLÀ.            |                                    |           |                             |                  |  |
|          |              |                        |                 |                                    |           |                             |                  |  |
| [        |              |                        |                 |                                    |           |                             |                  |  |
| 1        |              |                        |                 |                                    |           |                             |                  |  |
| ł        |              |                        |                 |                                    |           |                             |                  |  |
|          |              |                        |                 |                                    |           |                             |                  |  |
| 1        |              |                        |                 | ESTIMAT                            | ED ERROR. |                             | 1                |  |
|          |              |                        |                 | δT/K =                             | ±0.02 o   | or less: $\delta P/b$       | $ar = \pm 0.03;$ |  |
|          |              |                        |                 | $\delta x_{11} =$                  | ±0.0002   | $\delta y_{\rm HO} = \pm 0$ | 002              |  |
| 1        |              |                        |                 | (estime                            | ated by   | compiler).                  |                  |  |
|          |              |                        |                 |                                    | ~         |                             |                  |  |
| 1        |              |                        |                 | REFEREN                            | CES:      |                             |                  |  |
| 1        |              |                        |                 | 1. Str                             | eett, W   | . B., Cryogen               | ics, 1965,       |  |
|          |              |                        |                 | 5.                                 | 27.       |                             |                  |  |
| (        |              |                        |                 | ''                                 |           |                             |                  |  |
|          |              |                        |                 |                                    |           |                             |                  |  |
|          |              |                        |                 |                                    |           |                             |                  |  |
|          |              |                        |                 |                                    |           |                             |                  |  |

| COMPO                | ONENTS.     |                               |                              | ORIGINAL MEASUREMENTS:             |         |                               |                             |    |
|----------------------|-------------|-------------------------------|------------------------------|------------------------------------|---------|-------------------------------|-----------------------------|----|
| (1)                  | Helium. H   | ie. 7440-59-7                 | 7                            | Streett, W. B., Sonntag, R. E. and |         |                               |                             |    |
|                      | Hudrogon    | не, 1333-7/                   | 1-0                          | Van W                              | ylen, G | . J., J. Chen                 | n. Phys.,                   |    |
| (2)                  | nyurogeni   | ; 112; 1335-74                | -0                           | 1504,                              | 10, 13. |                               |                             |    |
| ļ                    |             |                               |                              |                                    |         |                               |                             |    |
| EXPERIMENTAL VALUES: |             |                               |                              |                                    |         |                               |                             |    |
|                      | <b>-</b> /1 | Mole fracti                   | on of helium                 |                                    | - 4     | Mole fractio                  | on of heli                  | um |
| Т/К                  | P/bar       | in liquid,<br><sup>x</sup> He | in vapor,<br><sup>Y</sup> He | Т/К                                | P/bar   | in liquid,<br><sup>x</sup> He | in vapo:<br><sup>y</sup> He | r, |
| 26 00                | 34 47       | 0 0848                        | 0 9152                       | 31 50                              | 15 51   | 0 0361                        | 0 1564                      |    |
| 29.00                | 8.76        | 0.0091                        | 0.9909                       | 51.50                              | 17.27   | 0.0483                        | 0.1835                      |    |
|                      | 12.07       | 0.0220                        | 0.9780                       |                                    | 20.68   | 0.0818                        | 0.2137                      |    |
|                      | 17.24       | 0.0459                        | 0.9541                       | 31 90                              | 24.20   | 0.1659                        | 0.1758                      |    |
|                      | 27.58       | 0.0963                        | 0.9037                       | 51.50                              | 13.79   | 0.0207                        | 0.0831                      | ł  |
| 30.60                | 20.68       | 0.0729                        | 0.3032                       |                                    | 16.44   | 0.0429                        | 0.1386                      |    |
| 31 00                | 34.47       | 0.1795                        | 0.3036                       |                                    | 18.03   | 0.0499                        | 0.1562                      |    |
| 51.00                | 13.72       | 0.0251                        | 0.9749                       |                                    | 19.96   | 0.0871                        | 0.1635                      |    |
|                      | 20.68       | 0.0749                        | 0.9251                       | 32 50                              | 21.27   | 0.1202                        | -                           |    |
|                      | 24.13       | 0.1103                        | 0.8897                       | 52.50                              | 13.79   | 0.0168                        | 0.9520                      |    |
|                      | 27.58       | 0.1564                        | 0.8436                       |                                    | 16.69   | 0.0509                        | -                           |    |
| 31.50                | 12.20       | 0.0127                        | 0.0767                       |                                    | 17.79   | 0.0675                        |                             |    |
|                      | 101/2       |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |
|                      |             |                               |                              |                                    |         |                               |                             |    |

| COMPON                                                 | ENTS:                                                                   |                                                                                                     |                                                                           | ORIGINAL MEASUREMENTS:            |                    |                                                                |                                                           |
|--------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------|--------------------|----------------------------------------------------------------|-----------------------------------------------------------|
| (1)                                                    | Helium:                                                                 | He: 7440-59-                                                                                        | -7                                                                        | Streett, W. B., Astrophysical J., |                    |                                                                |                                                           |
| (2)                                                    | Hvdrogen                                                                | : H <sub>2</sub> : 1333-                                                                            | 74-0                                                                      | 1973. 186. 1107                   |                    |                                                                |                                                           |
|                                                        |                                                                         | ,, 1000                                                                                             |                                                                           | <u></u> , -                       |                    |                                                                |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           |                                   |                    |                                                                |                                                           |
| VARIAB                                                 | VARIABLES:                                                              |                                                                                                     |                                                                           | PREPARED BY:                      |                    |                                                                |                                                           |
| Tempe                                                  | Temperature, pressure                                                   |                                                                                                     |                                                                           | C. L. Young                       |                    |                                                                |                                                           |
| EXPERIMENTAL VALUES:                                   |                                                                         |                                                                                                     |                                                                           | 1                                 |                    |                                                                |                                                           |
| т/к                                                    | P/bar                                                                   | Mole fraction<br>in hydrogen<br>rich phase,<br><sup>x</sup> He                                      | n of helium<br>in helium<br>rich phase,<br><sup>y</sup> He                | т/к                               | P/bar              | Mole fraction<br>in hydrogen<br>rich phase,<br><sup>x</sup> He | n of helium<br>in helium<br>rich phase<br><sup>y</sup> He |
| 26.00                                                  | 5.9                                                                     | 0.0058                                                                                              | 0.2637                                                                    | 27.80                             | 124                | 0.2660                                                         | 0.6295                                                    |
|                                                        | 8.7<br>13.1                                                             | 0.0137                                                                                              | 0.4290                                                                    | 28.47                             | 145<br>145         | _<br>0.3735                                                    | 0.6770                                                    |
| 27.18                                                  | 59                                                                      | 0.1624                                                                                              | 0.6264                                                                    | 20.17                             | 152                | 0.3364                                                         | 0.5833                                                    |
| Į                                                      | 83                                                                      | 0.1795                                                                                              | 0.6409<br>0.6513                                                          |                                   | 159<br>172         | 0.3147                                                         | 0.6150<br>0.6853                                          |
|                                                        | 97                                                                      | 0.2142                                                                                              | 0.6665                                                                    | ~~ ~~                             | 207                | 0.2347                                                         | 0.7335                                                    |
|                                                        | 124                                                                     | 0.2157                                                                                              | 0.6775                                                                    | 29.00                             | 22<br>25           | 0.0664                                                         | 0.4498                                                    |
|                                                        | 138                                                                     | 0.2061                                                                                              | 0.7236                                                                    |                                   | 30                 | 0.1059                                                         | 0.4865                                                    |
|                                                        | 172<br>210                                                              | 0.1846<br>0.1619                                                                                    | 0.7734                                                                    |                                   | 35<br>179          | 0.1335                                                         | 0.4913                                                    |
| 1                                                      | 241                                                                     | 0.1461                                                                                              | 0.8470                                                                    |                                   | 188                | 0.3271                                                         | 0.6196                                                    |
|                                                        | 275                                                                     | 0.1314<br>0.1176                                                                                    | 0.8686                                                                    |                                   | 207<br>241         | 0.2839                                                         | 0.6815                                                    |
|                                                        | 345                                                                     | 0.1079                                                                                              | 0.8910                                                                    |                                   | 276                | 0.1999                                                         | 0.7933                                                    |
|                                                        | 414<br>486                                                              | 0.0897                                                                                              | 0.923                                                                     |                                   | 345                | 0.1566                                                         | 0.8473                                                    |
|                                                        | 552                                                                     | 0.0640                                                                                              | 0.963                                                                     |                                   | 468                | 0.1101                                                         | 0.903                                                     |
|                                                        | 621                                                                     | 0.0549                                                                                              | 0.967                                                                     |                                   | 552                | 0.0911                                                         | 0.931                                                     |
| 27.80                                                  | 69                                                                      | 0.2092                                                                                              | 0.5787                                                                    |                                   | 683                | 0.0689                                                         | 0.9495                                                    |
|                                                        | 83<br>103                                                               | 0.2459<br>0.2721                                                                                    | 0.5704<br>0.5973                                                          | 31.00                             | 755<br>299         | 0.0610<br>0.3574                                               | 0.969<br>0.6180                                           |
|                                                        |                                                                         |                                                                                                     | AUXILIARY                                                                 | INFORMATI                         | ON                 |                                                                |                                                           |
| METHOD                                                 | APPARATI                                                                | US/PROCEDURE:                                                                                       |                                                                           | SOURCE A                          | ND PURIT           | Y OF MATERIALS:                                                |                                                           |
| Recir                                                  | culating                                                                | vapor flow an                                                                                       | pparatus                                                                  | No                                | detai              | ls given.                                                      |                                                           |
| composistain:<br>red w:<br>meter;<br>magnam<br>of lice | nents mad<br>less sted<br>ith plat:<br>; press<br>nin resis<br>quid and | de of special:<br>el. Temperat<br>inum resistand<br>ure measured v<br>stance gauge.<br>gas analysed | ly selected<br>ture measu-<br>ce thermo-<br>with<br>Samples<br>by thermal |                                   |                    |                                                                |                                                           |
| condu                                                  | ctivity.                                                                |                                                                                                     |                                                                           |                                   |                    |                                                                |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           | ESTIMATE                          | D ERROP.           |                                                                |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           | $\delta T/K =$                    | ±0.02;             | $\delta P/\text{bar} = \pm 0$                                  | .1%;                                                      |
|                                                        |                                                                         |                                                                                                     |                                                                           | δ <i>x</i> <sub>He</sub> , δ      | $y_{\text{He}} = $ | 10.0002.                                                       |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           | REFERENC                          | ES :               |                                                                |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           |                                   |                    |                                                                |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           |                                   |                    |                                                                |                                                           |
|                                                        |                                                                         |                                                                                                     |                                                                           |                                   |                    |                                                                |                                                           |
| 1                                                      |                                                                         |                                                                                                     |                                                                           | 1                                 |                    |                                                                |                                                           |

| COMPO    | DNENTS:      |                               |                               | ORIGINAL MEASUREMENTS: |                                   |                               |                               |
|----------|--------------|-------------------------------|-------------------------------|------------------------|-----------------------------------|-------------------------------|-------------------------------|
| (1)      | Helium; H    | le; 7440-59-7                 |                               | Street                 | Streett, W. B., Astrophysical J., |                               |                               |
| (2)      | llydrogen;   | H <sub>2</sub> ; 1333-74-     | -0                            | <u>1973</u> ,          | 100, 11                           |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
| EVDED    |              |                               |                               |                        |                                   |                               |                               |
| LAPER    | IMENIAL V    | ALUES:                        | c , , , ,                     |                        |                                   |                               | <i>.</i>                      |
| т/к      | P/bar        | in hydrogen                   | n of helium<br>in helium      | n<br>n <b>T/</b> K     | P/bar                             | Mole fractio                  | in of helium                  |
| l        |              | rich phase<br><sup>x</sup> He | rich phase<br><sup>y</sup> He | 9                      |                                   | rich phase<br><sup>x</sup> He | rich phase<br><sup>y</sup> He |
| <u> </u> |              | inc.                          | пс                            |                        |                                   | ne                            |                               |
| 31.00    | 311          | 0.3066                        | 0.6770                        | 61.50                  | 3789                              | 0.1445                        | 0.911                         |
|          | 371<br>412   | 0.2234                        | 0.7960<br>0.8297              | 70.30                  | 3668<br>3723                      | 0.393                         | 0.754                         |
|          | 483          | 0.1521                        | 0.8735                        |                        | 3864                              | 0.311                         | 0.810                         |
|          | 552<br>621   | 0.1273<br>0.1074              | 0.908<br>0.902                |                        | 4071<br>4282                      | 0.261<br>0.232                | 0.844<br>0.870                |
|          | 689          | 0.0919                        | 0.948                         |                        | 4346                              | 0.222                         | -                             |
|          | 758<br>896   | 0.0831                        | 0.954<br>0.968                |                        | 4482<br>4916                      | 0.197                         | 0.982                         |
| 34.95    | 507          | 0.4455                        | 0.6300                        | 77.61                  | 4491                              | 0.4243                        | 0.7042                        |
|          | 524          | 0.3614                        | 0.7266                        |                        | 4840                              | 0.3527                        | 0.8187                        |
|          | 586          | 0.2780                        | 0.7880                        |                        | 5192                              | 0.1944                        | 0.8980                        |
|          | 824          | 0.1419                        | 0.887                         | 84.82                  | 5516                              | 0.3711                        | -                             |
|          | 965<br>1103  | 0.1137                        | 0.946                         |                        | 5654<br>5864                      | 0.3326                        | 0.7830                        |
|          | 1179         | 0.0824                        | 0.968                         |                        | 6205                              | 0.2403                        | 0.842                         |
| 38.88    | 745<br>769   | 0.4301                        | 0.7055                        |                        | 6584<br>6984                      | 0.2066                        | 0.870                         |
|          | 831          | 0.3051                        | 0.7895                        | 93.00                  | 6550                              | 0.4270                        | 0.7330                        |
|          | 897<br>1036  | 0.2347                        | 0.822                         |                        | 6902<br>7239                      | 0.3578                        | 0.7960                        |
|          | 1173         | 0.1427                        | 0.907                         |                        | 7564                              | 0.2360                        | 0.864                         |
|          | 1380<br>1493 | 0.1095<br>0.0939              | -<br>0.957                    |                        | 7943<br>8137                      | 0.2020<br>0.1837              | 0.885<br>0.889                |
| 61.50    | 2758         | 0.3731                        | 0.7750                        | 100.00                 | 7598                              | 0.4351                        | 0.7203                        |
|          | 2785         | 0.3449<br>0.2989              | 0.7912<br>0.821               |                        | 7957<br>8274                      | 0.3420<br>0.2876              | 0.7850<br>0.8210              |
|          | 3110         | 0.2515                        | 0.858                         |                        | 8618                              | 0.2464                        | -                             |
|          | 3349<br>3527 | 0.2033                        | 0.882<br>0.901                |                        | 8977<br>9170                      | 0.2185                        | 0.872<br>0.892                |
|          | 3544         | 0.1764                        | -                             |                        | 9377                              | 0.1870                        | 0.896                         |
| <br>     |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |
|          |              |                               |                               |                        |                                   |                               |                               |

| COMPONENT                                                                                 | S:                                                                                                     |                                                                                                                                           | ORIGINAL M                      | ORIGINAL MEASUREMENTS:                                  |                                                                  |  |  |  |  |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------|------------------------------------------------------------------|--|--|--|--|
| (1) He                                                                                    | lium; He <sup>4</sup> ;                                                                                | 7440-59-7                                                                                                                                 | Hiza, M.                        | Hiza, M. J., Nat. Bur. Standards                        |                                                                  |  |  |  |  |
| (2) n-                                                                                    | Hydrogen; 1                                                                                            | n-H <sub>2</sub> ; 1333-74-0                                                                                                              | Tech. No                        | ote 621,                                                | 1972.                                                            |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           |                                 |                                                         |                                                                  |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           |                                 |                                                         |                                                                  |  |  |  |  |
| VARIABLES                                                                                 | 5:                                                                                                     |                                                                                                                                           | PREPARED E                      | BY:                                                     |                                                                  |  |  |  |  |
| Tempera                                                                                   | ture, pressu                                                                                           | ire                                                                                                                                       | C. L. Yo                        | oung                                                    |                                                                  |  |  |  |  |
| EXPERIMEN                                                                                 | TAL VALUES:                                                                                            |                                                                                                                                           |                                 |                                                         |                                                                  |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           |                                 |                                                         |                                                                  |  |  |  |  |
| т/к                                                                                       | Mole<br>P/bar                                                                                          | e fraction of hel<br>in liquid, x <sub>He</sub>                                                                                           | ium<br>4 T/K                    | M<br>P/bar                                              | lole fraction of heli<br>in liquid, <sup>x</sup> He <sup>4</sup> |  |  |  |  |
| 20.00                                                                                     | 0.9067                                                                                                 | 0.0000                                                                                                                                    | 26.00                           | 3.9334                                                  | 0.0000                                                           |  |  |  |  |
|                                                                                           | 11.208                                                                                                 | 0.0110                                                                                                                                    |                                 | 10.925                                                  | 0.0238                                                           |  |  |  |  |
|                                                                                           | 20.112                                                                                                 | 0.0211<br>0.0244                                                                                                                          |                                 | 12.490                                                  | 0.0283                                                           |  |  |  |  |
| 22.00                                                                                     | 5.8606                                                                                                 | 0.0000                                                                                                                                    |                                 | 16.024                                                  | 0.0373                                                           |  |  |  |  |
|                                                                                           | 9.777                                                                                                  | 0.0204                                                                                                                                    | 28.00                           | 20.257<br>5.730                                         | 0.0000                                                           |  |  |  |  |
| 24.00                                                                                     | 20.623                                                                                                 | 0.0343<br>0.0000                                                                                                                          |                                 | 8.356                                                   | 0.0141<br>0.0267                                                 |  |  |  |  |
|                                                                                           | 7.388<br>10.908                                                                                        | 0.0155<br>0.0231                                                                                                                          |                                 | 11.793<br>17.020                                        | 0.0264<br>0.0458                                                 |  |  |  |  |
|                                                                                           | 16.547<br>20.067                                                                                       | 0.0333<br>0.0411                                                                                                                          |                                 | 19.981                                                  | 0.0566                                                           |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           |                                 | (cont.)                                                 |                                                                  |  |  |  |  |
|                                                                                           |                                                                                                        | AUXILI                                                                                                                                    | ARY INFORMATIO                  |                                                         |                                                                  |  |  |  |  |
| METHOD /                                                                                  | APPARATUS/PF                                                                                           | OCEDURE :                                                                                                                                 | SOURCE ANI                      | SOURCE AND PURITY OF MATERIALS:                         |                                                                  |  |  |  |  |
| Recircu                                                                                   | lating vapor                                                                                           | flow apparatus                                                                                                                            | (1) Nat.                        | (1) Nat. Bureau of Mines A grade                        |                                                                  |  |  |  |  |
| circula                                                                                   | pper equilib<br>ting pump de                                                                           | scribed in ref.                                                                                                                           | - samp                          | sample.                                                 |                                                                  |  |  |  |  |
| Tempera<br>resistar<br>measured<br>Bourdon<br>liquid a<br>using th<br>detector<br>ref. 2. | ture measure<br>nce thermome<br>d with a dou<br>gauge. Sa<br>analysed by<br>hermistor th<br>rs. Detail | ed with platinum<br>eter and pressure<br>uble-revolution<br>mples of gas and<br>gas chromatograp<br>eermal conductivi<br>.s in source and | (2) Puri<br>seve                | (2) Purified sample equilibrated for<br>several months. |                                                                  |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           | ESTIMATED<br>るT/K = +           | ERROR:                                                  | P/bar = +0.004.                                                  |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           | $\delta x_{\rm He}^{4}, \delta$ | $y_{\text{He}^4} = \pm$                                 | 3% or 0.001 whicheven<br>is greater                              |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           | REFERENCE                       | cs :                                                    |                                                                  |  |  |  |  |
| 1                                                                                         |                                                                                                        |                                                                                                                                           | l. Hiza,                        | 1. Hiza, M. J. and Duncan, A. G.,                       |                                                                  |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           | 2. Dunca<br>Adv.                | in, A. G.<br>Cryog. E                                   | and Hiza, M. J.,<br>ngng., <u>1970</u> , <i>15</i> , 42.         |  |  |  |  |
|                                                                                           |                                                                                                        |                                                                                                                                           |                                 |                                                         |                                                                  |  |  |  |  |

ORIGINAL MEASUREMENTS: COMPONENTS: Hiza, M. J., Nat. Bur. Standards, Tech. Note 621, <u>1972</u>. (1) Helium; He; 7440-59-7 (2) n-Hydrogen; n-H<sub>2</sub>; 1333-74-0 EXPERIMENTAL VALUES: Mole fraction of helium in vapor, y<sub>He</sub><sup>4</sup> T/K P/bar 0.0000 20.00 0.9067 6.233 0.8049 10.414 0.8630 15.062 0.8867 19.281 0.8953 2.565 0.0000 24.00 0.5301 10.852 0.6543 15.517 0.7161 0.7506 20.202 26.00 3.9334 0.0000 8.735 0.4151 12.186 0.5335 16.289 0.5990 19.960 5.730 0.6218 28.00 0.0000 8.749 0.2259 11.931 0.3540 16.095 0.4374 20.343 0.4909

COMPONENTS: ORIGINAL MEASUREMENTS:  $(1)^{\prime}$ Helium; He; 7440-59-7 Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., J. Chem. Phys., 1968, 49, 2410. (2) p-Hydrogen; H<sub>2</sub>; 1333-74-0 VARIABLES: PREPARED BY: Temperature, pressure C. L. Young **EXPERIMENTAL VALUES:** Mole fraction of helium T/K *P/*bar in liquid, in vapor,  $x_{\rm He}$  $^{y}$ He 0.0461 0.903 20.40 58.0 0.0459 0.908 73.2 0.0442 0.914 86.7 0.0446 0.922 103.4 19.7 27.80 0.049 0.482 34.5 0.104 0.546 51.7 0.170 0.548 65.6 0.227 0.530 82.5 0.281 0.509 89.4 0.293 0.493 100.7 0.308 0.483 29.00 36.7 0.143 0.447 43.2 0.191 0.424 47.4 0.249 0.382 0.359 48.0 0.261 48.6 0.305 0.305 AUXILIARY INFORMATION METHOD / APPARATUS / PROCEDURE: SOURCE AND PURITY OF MATERIALS: Recirculating vapor flow apparatus with magnetic pump at ambient tempera-1. Bureau of Mines high purity sample. ture. Samples analysed by mass Matheson ultrapure sample obtained 2. spectrometry. Temperature measured as boil-off gas from equilibrated with platinum resistance thermometer. liquid at 0.68 bar. Pressure measured using Bourdon gauge. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.1;$  $\delta x_{\text{He}} = \pm 0.003 \text{ or less;} \quad \delta y_{\text{He}} = \pm 0.001$ **REFERENCES:** 

| COMPONENTS         | 5:                       |                                                                | ORIGINAL MEASUREMENTS:                                                                     |                       |                                                                |  |  |
|--------------------|--------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------|--|--|
| (1) H              | lelium; He               | e; 7440-59-7                                                   | Kidnay, A. J., Miller, R. C. and<br>Hiza, M. J., Ind. Eng. Chem. Fundam.,                  |                       |                                                                |  |  |
| (2) K              | rypton; i                | XI; 7439-90-9                                                  | <u>1971</u> , 10                                                                           | , 455.                |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
| VARIABLES          | :                        |                                                                | PREPARED B                                                                                 | Y:                    |                                                                |  |  |
| Tempera            | ture, pres               | ssure                                                          | C. L. You                                                                                  | ung                   |                                                                |  |  |
| EXPERIMENT         | TAL VALUES:              |                                                                | 1                                                                                          |                       |                                                                |  |  |
| т/к                | P/bar                    | Mole fraction of<br>helium in liquid<br>phase, x <sub>He</sub> | т/к                                                                                        | P/bar                 | Mole fraction of<br>helium in liquid<br>phase, x <sub>He</sub> |  |  |
| 117.09             | 10.03                    | 0.000252<br>0.000794                                           | 150.00                                                                                     | 10.38                 | 0.000417<br>0.00197                                            |  |  |
| 120.85             | 10.13                    | 0.00155                                                        |                                                                                            | 40.82                 | 0.00197                                                        |  |  |
|                    | 40.36                    | 0.00182                                                        |                                                                                            | 81.87                 | 0.0116                                                         |  |  |
| 100 00             | 121.4                    | 0.00378                                                        |                                                                                            |                       |                                                                |  |  |
| 129.60             | 4.77                     | 0.000315                                                       |                                                                                            |                       |                                                                |  |  |
|                    | 20.42                    | 0.00124                                                        |                                                                                            |                       |                                                                |  |  |
|                    | 42.04                    | 0.00521                                                        |                                                                                            |                       |                                                                |  |  |
|                    | 120.6                    | 0.00816<br>0.00824                                             |                                                                                            |                       |                                                                |  |  |
| 139.56             | 10.35 20.52              | 0.000526<br>0.00161                                            |                                                                                            |                       |                                                                |  |  |
|                    | 40.51<br>80.6            | 0.00364<br>0.00778                                             |                                                                                            |                       |                                                                |  |  |
|                    | 118.8                    | 0.0116                                                         |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
|                    |                          | AUXILIARY                                                      | INFORMATION                                                                                |                       |                                                                |  |  |
| METHOD /A          | PPARATUS/I               | PROCEDURE:                                                     | SOURCE AND PURITY OF MATERIALS:                                                            |                       |                                                                |  |  |
| Recircu<br>Tempera | lating vap<br>ture measu | por flow apparatus.<br>ared with platinum                      | <ol> <li>Bureau of Mines Grade A sample.</li> <li>Krypton Research grade sample</li> </ol> |                       |                                                                |  |  |
| resista<br>measure | nce thermo<br>d with Bou | ometer. Pressure<br>Ardon gauge. Liquid                        | purit<br>per c                                                                             | cy better<br>cent.    | than 99.9975 mole                                              |  |  |
| samples graphy.    | analysed<br>Details      | by gas chromato-<br>s in source and ref.1                      |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                | ESTIMATED                                                                                  | ERROR:                |                                                                |  |  |
|                    |                          |                                                                | $\delta T/K = \pm 0$ $\delta x_{He} = \pm 1$                                               | 0.05; δF<br>.% (esti  | <pre>/bar = ±0.3%;<br/>mated by compiler)</pre>                |  |  |
|                    |                          |                                                                | REFERENCES                                                                                 | 5:                    |                                                                |  |  |
|                    |                          |                                                                | 1. Dunca<br>Am. 1<br>733.                                                                  | n, A. G.<br>Inst. Che | and Hiza, M. J.,<br>em. Eng. J., <u>1970</u> , 16,             |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |
|                    |                          |                                                                |                                                                                            |                       |                                                                |  |  |

| COMPO | NENTS:      |           | EVALUATOR:                |  |
|-------|-------------|-----------|---------------------------|--|
| 1.    | Helium; He; | 7440-59-7 | Colin Young,              |  |
|       |             |           | School of Chemistry,      |  |
| 2.    | Neon: Ne:   | 7440-01-9 | University of Melbourne,  |  |
|       | ,           |           | Parkville, Victoria 3052, |  |
|       |             |           | AUSTRALIA.                |  |

There are only two published sets of results on this system. The temperature and pressure ranges of the data of Knorn (1) and Heck and Barrick (2) do not overlap appreciably. It is therefore difficult to establish the extent of agreement of the two sets of data solely on the basis of values in the overlapping range. Knorn's data are thought to be more accurate at low pressure. Both sets of data are classified as tentative.

#### References

- 1. Knorn, M., Cryogenics, <u>1967</u>, 7, 177.
- 2. Heck, C. K. and Barrick, P. L., Adv. Cryog. Engng., <u>1966</u>, 12, 714.

| COMPONEN | ITS:          |                               |                            | ORIGINAL MEASUREMENTS:                                                |                                 |                                     |                              |
|----------|---------------|-------------------------------|----------------------------|-----------------------------------------------------------------------|---------------------------------|-------------------------------------|------------------------------|
| (1)      | Helium;       | He; 7440-59                   | -7                         | Heck, C. K. and Barrick, P. L.,<br>Adv. Cryog. Engng., 1966, 12, 714. |                                 |                                     |                              |
| (2)      | Neon;         | Ne; 7440-01                   | -9                         |                                                                       | 0 0 1                           |                                     | •                            |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
| VARIABLE | ES :          |                               |                            | PREPARE                                                               | D BY:                           |                                     |                              |
| Temp     | erature,      | pressure                      |                            | с. г.                                                                 | Young                           |                                     |                              |
| EVDEDIME | NTAL VALU     | FC.                           |                            |                                                                       |                                 |                                     |                              |
|          | MINL VALU     | Mole fraction                 | of helium                  | n                                                                     |                                 | Mole fraction                       | on of helium                 |
| Т/К      | <i>P/</i> bar | in liquid,<br><sup>x</sup> He | in gas,<br><sup>y</sup> uo | т/к                                                                   | P/bar                           | in liquid,<br><sup>x</sup> uo       | in gas,<br><sup>y</sup> uo   |
|          |               | не                            | - he                       |                                                                       |                                 | не                                  | • не                         |
| 41.90    | 23.0          | 0.0100                        | 0.0784                     | 35.90                                                                 | 34.7                            | 0.0562                              | -                            |
|          | 25.6          | 0.0219                        | 0.119                      |                                                                       | 36.7                            | 0.0598                              | 0.613                        |
|          | 29.2          | 0.0366                        | 0.172                      |                                                                       | 47.6                            | 0.0831                              | -                            |
|          | 34.1          | 0.0602                        | 0.215                      |                                                                       | 54.1                            | 0.103                               | 0.637                        |
|          | 38.1          | 0.0801                        | 0.221                      |                                                                       | 55.4                            | 0.111                               | -                            |
|          | 39.9          | 0.0993                        | 0.226                      |                                                                       | 64.2                            | 0.134                               | 0.631                        |
| 38 88    | 42.3          | 0.173                         | 0.225                      |                                                                       | /3.3                            | 0.168                               | 0.615                        |
| 1 30.00  | 23.3          | 0.0248                        | 0.339                      |                                                                       | 91.4                            | 0.212                               | 0.580                        |
|          | 28.6          | 0.0416                        | 0.408                      |                                                                       | 96.9                            | -                                   | 0.537                        |
|          | 37.3          | 0.0701                        | 0.461                      | 32.89                                                                 | 8.1                             | -                                   | 0.410                        |
|          | 49.8          | 0.113                         | 0.485                      |                                                                       | 22.3                            | 0.0271                              | 0.702                        |
|          | 50.0          | 0.109                         | 0.463                      |                                                                       | 40.8                            | 0.0563                              | 0.760                        |
|          | 63.8          | -                             | 0.412                      |                                                                       | 76.9                            | 0.1170                              | 0.753                        |
|          | 64.1          | 0.230                         | -                          |                                                                       | 90.8                            | -                                   | 0.735                        |
| 35.90    | 10.7          | -                             | 0.239                      |                                                                       | 91.7                            | 0.143                               |                              |
|          | 17.8          | ~                             | 0.458                      |                                                                       | 116.5                           | 0.205                               | 0.715                        |
|          | 22.3          | 0.0195                        | 0.538                      |                                                                       | 141 0                           | _<br>0 272                          | 0.661                        |
|          | 23.5          | 0.0311                        | -                          |                                                                       | 160.2                           | 0.356                               | 0.575                        |
|          | 26.1          | 0.0372                        | -                          | 29.91                                                                 | 6.9                             | -                                   | 0.658                        |
|          | 29.0<br>33.9  | -                             | 0.587<br>0.605             |                                                                       | 15.3<br>30.5                    | 0.0087<br>0.0279                    | 0.798<br>0.854               |
|          |               |                               |                            |                                                                       | -                               |                                     |                              |
|          | <u> </u>      |                               | AUXILIARY                  | INFORMAT                                                              | TION                            | -                                   |                              |
| METHOD , | APPARAT       | US/PROCEDURE:                 |                            | SOURCE                                                                | AND PURITY                      | OF MATERIALS:                       |                              |
| Vapor :  | recircul      | ated through c                | ell.                       | 1. In                                                                 | purities                        | s of 20 parts                       | s per million                |
| Liquid   | and vap       | or samples ana                | red                        | ma                                                                    | inly nec                        | on.                                 |                              |
| measur   | ed by Bo      | urdon gauge an                | d tempera-                 | 2. Im                                                                 | purities                        | of 80 parts                         | per million                  |
| ture m   | easured       | with platinum :               | resistance                 | ma                                                                    | inly hel                        | ium.                                |                              |
| thermon  | meter.        | Details in so                 | urce and                   |                                                                       |                                 |                                     |                              |
| ref. 1   | •             |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            | ESTIMAT                                                               | ED ERROR:                       |                                     |                              |
|          |               |                               |                            | δт/К =                                                                | ±0.05;                          | $\delta P/\text{bar} = \pm 0$       | .1 up to 100                 |
|          |               |                               |                            | $bar = \delta x_{Ho} =$                                               | $\pm 0.3$ bet $\delta y_{He} =$ | ween 100 and<br>±3%.                | l 300 bar;                   |
|          |               |                               |                            | DECEDEN                                                               | ICES.                           |                                     |                              |
|          |               |                               |                            |                                                                       |                                 | N 7 P                               | wick D                       |
|          |               |                               |                            | л. не<br>Ad                                                           | v. Cryog                        | . N. and Bar<br>. Engng., <u>19</u> | <u>65</u> , <i>10</i> , 151. |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
|          |               |                               |                            |                                                                       |                                 |                                     |                              |
| 1        |               |                               |                            | 1                                                                     |                                 |                                     |                              |

COMPONENTS: ORIGINAL MEASUREMENTS: Heck, C. K. and Barrick, P. L., Adv. Cryog. Engng., <u>1966</u>, 12, 714. Helium; He; 7440-59-7 (1) (2) Neon; Ne; 7440-01-9 Mole fraction of helium P/bar in liquid, in gas, Т/К in gas,  $x_{\rm He}$  $y_{\rm He}$ 29.91 50.4 0.0492 0.863 0.0734 71.5 0.855 90.9 0.0893 0.844 112.7 0.106 0.831 130.2 0.126 131.9 0.815 156.4 0.155 -0.794 162.1 190.5 0.770 199.6 0.197 203.4 -0.760 26.95 2.8 0.625 -5.4 0.810 9.8 0.877 20.6 0.0111 0.9013 0.0291 41.6 0.9262 61.8 0.0420 62.0 0.9220 83.6 0.0532 0.9132 113.0 0.9033 120.6 0.0723 142.1 0.8919 142.3 0.0824 172.3 0.0896 0.885 194.9 0.103 203.1 0.875

| COMPONENTS    |          | <b></b>     |                 | ODICINAL ARACUDEMENTS .                                           |
|---------------|----------|-------------|-----------------|-------------------------------------------------------------------|
| (1) Helju     | m. He:   | 7440-59-7   |                 | UNIGINAL REASONERENIS:                                            |
|               | ,,       | /440 55 /   |                 | KIOIN, M., Cryogentes, <u>1507</u> , 7, 177.                      |
| (2) Neon;     | Ne;      | 7440-01-9   |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               | ·······  |             | ·····           |                                                                   |
| VARIABLES:    |          |             |                 | PREPARED BY:                                                      |
| Temperatur    | e, press | ure         |                 | C. L. Young                                                       |
| _             | -        |             |                 | -                                                                 |
| FYPERIMENTAL  | VALUES   |             |                 |                                                                   |
| DAI DAIIDAIAD | VALUED.  | Mole fract  | ion of          |                                                                   |
| T/K           | P/bar    | helium      |                 |                                                                   |
| -/            | -, 242   | in liquid   | in gas          |                                                                   |
|               |          | "Не         | <sup>9</sup> He |                                                                   |
|               |          |             |                 | _                                                                 |
| 24.71         | 6.1      | 0.0024      | 0.897           |                                                                   |
|               | 11.1     | 0.0041      | 0.931           |                                                                   |
|               | 21.3     | 0.0073      | 0.950           |                                                                   |
|               | 26.3     | 0.0086      | 0.951           |                                                                   |
|               | 31.4     | 0.0105      | 0.951           |                                                                   |
| 26.00         | 6.1      | 0.0029      | 0.842           |                                                                   |
|               | 16.2     | 0.0048      | 0.924           |                                                                   |
|               | 21.3     | 0.0086      | 0.931           |                                                                   |
|               | 26.3     | 0.0107      | 0.936           |                                                                   |
| 26.00         | 31.4     | 0.0130      | 0.938           |                                                                   |
|               | 51.7     | 0.0204      | 0.937           |                                                                   |
| 27.03         | 6.1      | 0.0030      | 0.803           |                                                                   |
|               | 11.1     | 0.0054      | 0.872           |                                                                   |
|               | 16.2     | 0.0076      | 0.900           |                                                                   |
|               | 26.3     | 0.0135      | 0.914           |                                                                   |
|               | 31.4     | 0.0150      | 0.915           |                                                                   |
|               | 41.5     | 0.0206      | 0.914           |                                                                   |
|               | 51.7     | 0.0255      | 0.913           |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             | AUXILIARY       | INFORMATION                                                       |
| METHOD /APP   | ARATUS/P | ROCEDURE:   |                 | SOURCE AND PURITY OF MATERIALS:                                   |
| Flow appara   | atus des | cribed in r | ef. 1.          | No details given.                                                 |
| Gas and lic   | quid pha | ses analyse | d using         |                                                                   |
| ferometer.    | cograpny | and gas in  | ter-            |                                                                   |
| 1010110 1011  |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 | ESTIMATED ERROR:                                                  |
|               |          |             |                 | $\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.01;$                |
|               |          |             |                 | $\delta x_{\rm He} = \pm 0.0002;  \delta y_{\rm He} = \pm 0.001.$ |
|               |          |             |                 |                                                                   |
|               |          |             |                 | REFERENCES                                                        |
|               |          |             |                 | 1 Sobmidt V Valtataahmik 1966                                     |
|               |          |             |                 | 1. Schmidt, K., Kattelechnik, <u>1966</u> ,<br>18. 331.           |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |
|               |          |             |                 |                                                                   |

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COMPONENTS:

1. Helium; He; 7440-59-7

2. Nitrogen; N<sub>2</sub>; 7727-37-9

Barkville, Victoria 3052,

AUSTRALIA.
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This is the most extensively studied system containing helium. The data of Kharakhorin (1) and Gonikberg and Fastowsky (2) appear to be higher than the data obtained by interpolation of more recent results and are both classified as doubtful.

The data of Tully *et al.* (3), Burch (4), De Vaney *et al.* (5), Rodewald *et al.* (6), Davis *et al.* (7) and Streett and coworkers (8), (9) and (10) are in reasonable agreement in overlapping ranges of pressure and temperature. The data of Streett and coworkers (8), (9) and (10) cover a much wider range of pressure than other data on this system. These six sets of data are classified as tentative.

The data of Skripka and Dykhno (11) are slightly lower than the data obtained by interpolation of the results given in references above and are therefore classified as doubtful.

The data of Davydov and Budnevich (12) are rejected as they are presented in small scale graphical form.

# References

- Kharakhorin, F. F., Zhur. Tech. Fiz., <u>1940</u>, 10, 1533 (Russian), Foreign Petrol. Tech., <u>1941</u>, 9, 397 (Eng. Trans.).
- Gonikberg, M. G. and Fastowsky, W. G., Acta Physicochimica U.R.S.S., <u>1940</u>, 12, 67.
- Tully, P. C., De Vaney, W. E. and Rhodes, H. L., Adv. Cryog. Engng., <u>1971</u>, 16, 98.
- 4. Burch, R. J., J. Chem. Engng. Data, 1964, 9, 19.
- De Vaney, W. E., Dalton, B. J. and Meeks, J. C. Jr., J. Chem. Engng. Data, 1963, 8, 473.
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- Davis, J. A., Rodewald, N. and Kurata, F., Ind. Eng. Chem., <u>1963</u>, 55, no. 11, 36.
- 8. Streett, W. B., Chem. Eng. Prog. Symp. Ser. No. 61, 1967, 63, 37.
- 9. Streett, W. B. and Hill, J. L. E., J. Chem. Phys., <u>1970</u>, 52, 1402.
- 10. Streett, W. B. and Erickson, A. L., Physics Earth Planetary Interiors, <u>1972</u>, 5, 357.
- 11. Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1964</u>, 8, 163.
- Davydov, I. A. and Budnevich, S. S., Inzh. Fiz. Zhur., <u>1971</u>, 20, no. 6, 82.

| COMPONENTS |                      |                         |                 | ODICINAL MEACHDEMENTS.             |                     |                       |                  |
|------------|----------------------|-------------------------|-----------------|------------------------------------|---------------------|-----------------------|------------------|
| COMPONE    | N15:                 |                         |                 | ORIGINAL MEASUREMENTS:             |                     |                       |                  |
| (1) H      | elium; H             | e; 7440-59-             | 7               | Streett, W. B. and Hill, J. L. E., |                     |                       |                  |
| (2) N      | litrogen;            | N <sub>2</sub> ; 7727-3 | 7-9             | J. Chem.                           | . Phys.,            | <u>1970</u> , 52, 14  | 02.              |
|            | -                    |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
| VADTABI    | FC.                  |                         |                 |                                    | DV.                 |                       |                  |
| VARIADE    |                      |                         |                 | FREFARED .                         | DI:                 |                       |                  |
| Temper     | ature, pr            | essure                  |                 | C. L. Yo                           | oung                |                       |                  |
| EVDEDIN    | THE TAT MATTIE       |                         |                 |                                    |                     |                       |                  |
| EXPERIM    | ENIAL VALUE          | Mole fracti             | on of heliu     | m                                  |                     | Mole fraction         | of helium        |
| Т/К        | P/bar                | in liquid,              | in vapor        | , Т/К                              | <i>P/</i> bar       | in liquid,            | in vapor,        |
|            |                      | "Не                     | <sup>9</sup> He |                                    |                     | "Не                   | <sup>9</sup> He  |
| 77.48      | 344.5                | 0.0426                  | 0.9868          | 95.47                              | 1379.0              | 0.1600                | 0.9665           |
|            | 548.2<br>686 0       | 0.0542                  | 0.9814          |                                    | 1661.7              | 0.1606                | 0.9695           |
|            | 820.7                | 0.0623                  | 0.9860          |                                    | 2205.8              | 0.1616                | 0.9715           |
|            | 896.7                | 0.0648                  | 0.9849          |                                    | 2482.5              | 0.1605                | 0.9715           |
|            | 931.2                | 0.065                   | 0.985           |                                    | 2623.3              | 0.1591                | 0.9715           |
| 87.82      | 130.7                | 0.0366                  | 0.9550          |                                    | 2068.0              | 0.1587                | 0.9722           |
|            | 410.4                | 0.0805                  | 0.9709          |                                    | 2202.8              | 0.1557                | 0.9824           |
|            | 548.2                | 0.0927                  | 0.9755          |                                    | 2482.5              | 0.1539                | 0.9838           |
|            | 693.1                | 0.1010                  | 0.9773          |                                    | 2620.3              | 0.151                 | 0.984            |
|            | 827.8                | 0.1064                  | 0.9792          | 100.61                             | 713.3               | 0.1822                | 0.9494           |
|            | 1103.4               | 0.1120                  | 0.9822          |                                    | 965.6               | 0.1948                | 0.9523           |
|            | 1216.9               | 0.1132                  | 0.9814          |                                    | 1103.4              | 0.1983                | 0.9568           |
|            | 1376.0               | 0.1148                  | 0.9837          |                                    | 1234.1              | 0.2000                | 0.9604           |
|            | 1654.6               | 0.1153                  | 0.9851          |                                    | 1661 7              | 0.2010                | 0.9631           |
|            | 1789.4               | 0.1153                  | 0.9870          |                                    | 1930.2              | 0.1981                |                  |
| _          | 1826.9               | 0.115                   | 0.987           |                                    | 2205.8              | 0.1943                | 0.9746           |
| 95.47      | 713.3                | 0.1324                  | 0.9579          |                                    | 2482.5              | 0.1903                | 0.9777           |
|            | 965.6                | 0.1429                  | 0.9539          |                                    | 2023.3              | 0.1862                | 0.9792           |
|            | 1103.4               | 0.1546                  | 0.9630          |                                    | 3058.0              | 0.1815                | 0.9792           |
|            | 1234.1               | 0.1582                  | 0.9704          |                                    | 3102.6              | 0.182                 | 0.979            |
|            |                      |                         | AUXILIARY       | INFORMATIC                         | )N                  |                       |                  |
| METHOD     | /APPARATU            | S/PROCEDURE:            |                 | SOURCE AN                          | D PURITY            | OF MATERIALS:         |                  |
| Recirc     | ulating v            | apor flow ap            | paratus         | N                                  | lo detai            | ls given.             |                  |
| with m     | agnetic p            | ump at ambie            | nt tempera-     |                                    |                     |                       |                  |
| ture.      | Samples              | analysed by             | thermal         |                                    |                     |                       |                  |
| with p     | tivity.<br>latinum r | Temperature             | measured        |                                    |                     |                       |                  |
| Pressu     | re measur            | ed with Bour            | don gauge.      |                                    |                     |                       |                  |
| Detail     | s in sour            | ce and ref.             | 1.              |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 | ESTIMATED                          | ERROR:              | SP /ham - +7.         |                  |
|            |                      |                         |                 | $OT/K = \pm$                       | 0.01;               | $\frac{1}{2}$         |                  |
|            |                      |                         |                 | $^{ox}$ He $^{ox}$                 | $y_{\text{He}} = 1$ | 0.001.                |                  |
|            |                      |                         |                 | DEPENDING                          | <b>C</b> .          |                       |                  |
|            |                      |                         |                 | KEFERENCE                          | тт 14 .<br>9:       | 0                     | 1065             |
|            |                      |                         |                 | 1. Stree                           | ττ, W. J            | <b>b.,</b> Cryogenice | s, <u>1905</u> , |
|            |                      |                         |                 | 5,27                               | •                   |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
|            |                      |                         |                 |                                    |                     |                       |                  |
| 1          |                      |                         |                 | 1                                  |                     |                       |                  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Helium; He; 7440-59-7 Streett, W. B. and Hill, J. L. E., J. Chem. Phys., 1970, 52, 1402. (2)Nitrogen; N<sub>2</sub>; 7727-37-9 EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium T/K P/bar in liquid. in gas, T/K P/bar in liquid, in gas,  $x_{\rm He}$ ₽́He x<sub>He</sub> <sup>y</sup><sub>He</sub> 107.32 454.9 0.2052 0.8931 120.59 971.7 0.5570 0.7188 0.9029 552.2 0.2230 1010.2 0.5393 0.7399 689.0 0.9119 0.2411 1027.4 0.5346 0.7501 0.9185 830.9 0.2515 1089.2 0.5231 968.7 0.2581 0.9264 1120.7 0.5166 0.7712 0.9308 1103.4 0.2614 1224.0 0.5006 0.7977 1241.2 0.2628 0.9470 0.8182 1323.3 0.4890 1379.0 0.2628 0.9430 1523.9 0.4648 0.8490 0.9454 1516.8 0.2621 0.4433 1775.2 0.8714 1654.6 0.2600 0.9493 2062.0 0.4225 0.8926 1799.5 0.2589 0.9530 2402.4 0.3999 0.9098 1930.2 0.2561 0.9572 2719.6 0.3820 0.9236 2199.8 0.2509 0.9618 3102.6 0.3640 0.9358 2482.5 0.2435 0.9647 3447.1 0.3474 0.9438 2751.0 0.2380 0.9670 3764.2 0.3357 0.9491 0.2316 3033.7 0.9701 124.05 1613.1 0.6400 0.6970 3309.3 0.2257 0.9730 1657.7 0.5856 0.9759 3584.9 0.2207 0.7844 1696.2 0.5782 3964.8 0.2150 0.9796 1792.4 0.5517 0.8071 1053.0 0.9827 0.2118 1930.2 0.5225 0.8341 112.10 551.2 0.8589 0.2808 2072.0 0.5011 0.8503 689.0 0.7333 0.3008 0.8723 2126.8 0.6185 827.8 0.3111 0.8850 0.7694 2161.3 0.6032 965.6 0.3171 0.8943 2202.8 0.5919 0.7899 0.3197 0.9031 1103.4 0.5554 2350.7 0.8317 1241.2 0.3197 0.9098 2482.5 0.5265 0.8485 1351.7 0.3189 0.9174 2774.3 0.4911 0.8768 1516.8 0.9238 0.3167 3092.4 0.4600 0.8980 1792.4 0.3124 0.9344 3451.1 0.4354 0.9123 2068.0 0.3043 0.9423 3802.7 0.4126 0.9247 0.9497 2344.7 0.2946 4137.1 0.3945 0.9313 2620.3 0.2870 0.9540 130.00 2778.3 0.5988 2895.9 0.2785 0.9604 2830.0 0.5862 0.2708 3122.8 0.9630 2896.9 0.5733 \_ 489.4 117.13 0.3545 0.7699 3047.9 0.5469 0.8124 0.3869 620.1 0.7914 3316.4 0.5126 0.8552 689.0 0.3970 0.8015 0.4716 0.8930 3726.7 827.8 0.4086 0.8198 4137.1 0.4450 0.9083 965.6 0.4091 0.8376 134.00 3481.5 0.6181 -1103.4 0.4072 0.8539 3515.8 0.6085 1241.2 0.4034 0.8675 3596.0 0.5905 0.8139 1379.0 0.3984 0.8794 0.5819 3653.8 0.8841 1516.8 0.3922 3795.6 0.5620 0.8489 1654.6 0.3859 0.8986 4133.0 0.5184 0.8802 1792.4 0.9069 0.3814 136.50 3930.4 0.6400 0.7405 2068.0 0.3677 0.9211 4036.8 0.6073 0.7733 2344.7 0.9304 0.3556 4109.7 0.5910 0.7750 2551.4 0.3999 0.9367 2854.3 0.3355 0.9451 119.60 562.4 0.4905 0.6772

689.0

830.9

965.6

1106.5

0.5011

0.5058

0.4938

0.4792

0.7159

0.7763

0.0082

| COMPONENTS .          |                   |                            |                        | ORTGINAL MEASUREMENTS .              |               |                                      |                           |  |
|-----------------------|-------------------|----------------------------|------------------------|--------------------------------------|---------------|--------------------------------------|---------------------------|--|
|                       | 5.                |                            |                        | OKIGINAL MERSUREMENTS.               |               |                                      |                           |  |
| (l) He                | lium;             | He; 7440-59-7              |                        | Streett, W. B., and Erickson, A. L., |               |                                      |                           |  |
| (2) Ni                | trogen            | ; N <sub>2</sub> ; 7727-37 | -9                     | 1972.                                | 5, 357        | •                                    | certors                   |  |
|                       |                   |                            |                        | ,                                    | •             |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
| VARIABLES             | 5:                |                            |                        | PREPARED H                           | BY:           |                                      |                           |  |
| Temperature, pressure |                   |                            |                        | С. L. У                              | loung         |                                      |                           |  |
|                       |                   |                            |                        |                                      | 2             |                                      |                           |  |
| EXPERIMEN             | TAL VALU          | JES:                       |                        |                                      |               |                                      |                           |  |
| т/к                   | <i>P/</i> bar     | Mole fraction in liquid.   | of helium<br>in vapor. | т/к                                  | P/bar         | Mole fraction                        | of helium                 |  |
| -, -:                 | -,                | <sup>x</sup> He            | y <sub>He</sub>        | _,                                   | -,            | <sup>x</sup> He                      | үцрог,<br>У <sub>НР</sub> |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
| 112.10                | 2463<br>3102      | 0.3035<br>0.2866           | 0.9544<br>0.9644       | 124.05                               | 3123          | 0.4294                               | 0.9206                    |  |
|                       | 3453              | 0.2780                     | 0.9680                 |                                      | 3598          | 0.4017                               | 0.9289                    |  |
|                       | 3798              | 0.2694                     | 0.9716                 |                                      | 4177          | 0.3768                               | 0.9463                    |  |
|                       | 4171              | 0.2517                     | 0.9769                 |                                      | 5059          | 0.3390                               | 0.9539                    |  |
|                       | 4515              | 0.251                      | 0.9763                 |                                      | 5522          | 0.3263                               | 0.9642                    |  |
|                       | 4710              | 0.2474                     | 0.9778                 |                                      | 6072          | 0.3122                               | 0.9691                    |  |
|                       | 4828              | 0.2457                     | 0.9984                 |                                      | 6841          | 0.2948                               | 0.9733                    |  |
|                       | 4921 <sup>a</sup> | 0.244                      | 0.979                  |                                      | 6962          | 0.290                                | 0.974                     |  |
| 117.13                | 1105              | 0.4224                     | 0.8568                 | 130.00                               | 4083          | 0.4521                               | 0.9157                    |  |
|                       | 1969              | 0.3835                     | 0.9135                 |                                      | 4918          | 0.4073                               | 0.9290                    |  |
|                       | 2803              | 0.350                      | 0.9441                 |                                      | 5600          | 0.3811                               | 0.9525                    |  |
|                       | 3446              | 0.3248                     | 0.9565                 |                                      | 6268          | 0.3578                               | 0.9602                    |  |
|                       | 4149              | 0.3051                     | 0.9638                 |                                      | 7204          | 0.3344                               | 0.9781                    |  |
|                       | 4508              | 0.3003                     | 0.9665                 |                                      | 7681          | 0.3247                               | 0.9649                    |  |
|                       | 5112              | 0.2757                     | 0.9725                 |                                      | 7864          | 0.3219                               | 0.9693                    |  |
|                       | 5652              | -                          | 0.9765                 |                                      | 7913          | 0.3150                               | 0.9689                    |  |
|                       | 5721 <sup>a</sup> | 0.262                      | 0.977                  |                                      | 8051          | 0.3143                               | -                         |  |
| 124.05                | 2420              | 0.4773                     | 0.8850                 |                                      | 8111          |                                      | 0 071                     |  |
|                       | 2782              | 0.4494                     | 0.9048                 | 134.00                               | 4145          | 0.5231                               | 0.8773                    |  |
|                       |                   |                            |                        | TNEOPMATIO                           | N             |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
| METHOD /              | APPARAI           | US/PROCEDURE:              |                        | SOURCE AND PURITY OF MATERIALS:      |               |                                      |                           |  |
| Recircu               | lating            | vapor flow app             | baratus                | No deta                              | ils gi        | .ven.                                |                           |  |
| measure               | d with            | platinum resis             | tance                  |                                      |               |                                      |                           |  |
| thermom               | eter.             | Pressure meas              | sured with             |                                      |               |                                      | 1                         |  |
| magnani               | n resis<br>id and | tance gauge.               | Samples                |                                      |               |                                      |                           |  |
| conduct:              | ivity.            | Details in s               | ource.                 |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        | <br>                                 | 888.6-        |                                      |                           |  |
|                       |                   |                            | ESTIMATED              | ERROR:                               |               |                                      |                           |  |
|                       |                   |                            |                        | $\delta T = \delta T$                | $\frac{1}{2}$ | $0P/bar = \pm 5;$<br>the mole per ce | nt                        |  |
|                       |                   |                            | He'                    | "He                                  | compiler)     |                                      |                           |  |
|                       |                   |                            |                        |                                      |               | combilet).                           |                           |  |
|                       |                   |                            |                        | REFERENCE                            | 5:            |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |
|                       |                   |                            |                        |                                      |               |                                      |                           |  |

| COMPON         | ENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                          | ORIGINAL MEASUREMENTS:                                                                             |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) H<br>(2) N | <ul> <li>(1) Helium; He; 7440-59-7</li> <li>(2) Nitrogen; N<sub>2</sub>; 7727-37-9</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                          | Streett, W. B., and Erickson, A. L.,<br>Physics Earth Planetary Interiors<br><u>1972</u> , 5, 357. |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                  | on, A. L.,<br>teriors                                                                                                                                                                                                                                                                                                                                             |
| т/к            | P/bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Mole fraction<br>in liquid,<br><sup>x</sup> He                                                                                                                                                                                                                                                                                                                                                                                                           | of helium<br>in vapor,<br><sup>y</sup> He                                                                                                                                                                                                                                                                                                                                                                | т/к                                                                                                | P/bar                                                                                                                                                                                                                                                                                            | Mole fraction<br>in liquid,<br><sup>x</sup> He                                                                                                                                                                                                                                                                                                                   | of helium<br>in vapor<br><sup>y</sup> He                                                                                                                                                                                                                                                                                                                          |
| 134.00         | 4851<br>5383<br>6954<br>7430<br>8209<br>8426<br>88974<br>8209<br>8426<br>88974<br>88974<br>8209<br>8426<br>4250<br>4250<br>4251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84251<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84551<br>84552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>8555552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>85552<br>855552<br>855552<br>855552<br>855555555 | 0.4737<br>0.4475<br>0.4124<br>0.3949<br>0.3756<br>0.3611<br>0.3483<br>0.3354<br>0.3252<br>0.3218<br>0.321<br>0.734<br>0.6468<br>0.6307<br>0.6181<br>0.6051<br>0.5926<br>0.5855<br>0.5733<br>0.5429<br>0.5093<br>0.4817<br>0.4577<br>0.4540<br>0.4577<br>0.4540<br>0.3970<br>0.3802<br>0.3716<br>0.3970<br>0.3566<br>0.347<br>0.3597<br>0.3566<br>0.347<br>0.5429<br>0.5970<br>0.3597<br>0.3566<br>0.347<br>0.3597<br>0.3566<br>0.347<br>0.6311<br>0.6312 | 0.9141<br>0.9255<br>0.9399<br>0.9473<br>0.9534<br>-<br>0.9564<br>0.960<br>0.9693<br>0.970<br>0.734<br>0.9292<br>0.8159<br>0.8447<br>0.8578<br>0.8651<br>0.8774<br>0.8938<br>0.9089<br>0.9234<br>0.9345<br>0.9345<br>0.9345<br>0.9349<br>0.9345<br>0.9349<br>0.9345<br>0.9349<br>0.9345<br>0.9349<br>0.9345<br>0.9349<br>0.9505<br>0.95574<br>-<br>0.9628<br>0.963<br>0.749<br>0.8663<br>0.8529<br>0.8634 | 144.00<br>154.00<br>158.0                                                                          | 5693<br>5783<br>5884<br>5996<br>6255b<br>7617<br>7734<br>7927<br>8064<br>8292<br>8458<br>8692<br>8458<br>8692<br>8581<br>8664<br>8581<br>8664<br>8581<br>8664<br>8699<br>8719<br>8802<br>9505<br>9726<br>9505<br>9726<br>9926<br>10133<br>9574<br>9657<br>9726<br>9781<br>9912<br>10064<br>10201 | 0.6121<br>0.6019<br>0.5929<br>0.5826<br>0.5532<br>0.755<br>0.6723<br>0.6388<br>0.6210<br>0.6025<br>0.5851<br>0.5679<br>0.5480<br>0.5295<br>0.5136<br>0.5042<br>0.760<br>0.6938<br>0.6880<br>0.6780<br>0.6744<br>0.6699<br>0.6512<br>0.6316<br>0.6071<br>0.5871<br>0.5682<br>0.559<br>0.5461<br>0.767<br>0.6887<br>0.6887<br>0.6719<br>0.6442<br>0.6289<br>0.6152 | 0.8694<br>0.8735<br>0.8789<br>0.8852<br>0.8987<br>0.755<br>0.8805<br>0.8643<br>0.9192<br>0.8878<br>0.9147<br>0.9118<br>0.9147<br>0.9118<br>0.9243<br>0.9243<br>0.9329<br>0.760<br>0.8626<br>0.8665<br>0.8665<br>0.8665<br>0.8665<br>0.8580<br>0.8716<br>0.8716<br>0.9041<br>0.9006<br>0.90138<br>0.767<br>0.8445<br>0.852<br>0.8585<br>0.8699<br>0.8789<br>0.8861 |
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <sup>a</sup> Three-phas<br><sup>b</sup> Critical p                                                                                                                                                                                                                                                                                                                                                                                                       | e pressure<br>pressure ±20                                                                                                                                                                                                                                                                                                                                                                               | ±10 bar.                                                                                           |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                   |

| COMDONENTE +                       |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            | ODICINAL MEACHDEMENTS.                                                                                                                      |                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMPON                             | EN12:                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            | ORIGINAL MEASUREMENTS:                                                                                                                      |                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
| (1) 1<br>(2) 1                     | Helium;<br>Nitrogen                                                                                                                                                                                                                         | He; 7440-59-7<br>; N <sub>2</sub> ; 7727-37                                                                                                                                                                                                  | 7<br>7-9                                                                                                                                                                                                                                                                   | Kharakhorin, F. F., Zhur. Tekh. Fiz.,<br><u>1940</u> , 10, 1533 (Russian); Foreign<br>Petrol. Tech., <u>1941</u> , 9, 397 (Eng.<br>Trans.). |                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
|                                    |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            |                                                                                                                                             |                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
| VARIAB                             | LES:                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            | PREPARED                                                                                                                                    | BY:                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
| Tempe                              | rature, j                                                                                                                                                                                                                                   | pressure                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                            | с. г.                                                                                                                                       | Young                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
| EXPERI                             | MENTAL VAL                                                                                                                                                                                                                                  | UES:                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                            |                                                                                                                                             |                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
| т/к                                | P/bar                                                                                                                                                                                                                                       | Mole fraction<br>in liquid,<br><sup><i>x</i></sup> He                                                                                                                                                                                        | of helium<br>in vapor,<br><sup>y</sup> He                                                                                                                                                                                                                                  | т/к                                                                                                                                         | P/bar                                                                                                                                                                                                                                     | Mole fraction<br>in liquid,<br><sup>x</sup> He                                                                                                                                                                                                                                                        | of helium<br>in vapor<br><sup>y</sup> He                                                                                                                                                                                                                         |
| 68.0<br>77.3<br>90.1               | $\begin{array}{c} 4.54\\ 11.77\\ 22.60\\ 49.14\\ 93.98\\ 96.97\\ 109.43\\ 146.41\\ 4.91\\ 11.75\\ 22.60\\ 34.35\\ 49.14\\ 59.38\\ 72.19\\ 79.03\\ 98.59\\ 112.88\\ 122.60\\ 146.92\\ 148.44\\ 160.30\\ 160.60\\ 4.90\\ 11.80\\ \end{array}$ | 0.00107<br>0.00195<br>0.00370<br>0.00885<br>0.01145<br>0.01160<br>0.01240<br>0.01480<br>0.0098<br>0.00300<br>0.00460<br>0.00730<br>0.00960<br>0.01125<br>0.01520<br>0.01585<br>0.02300<br>0.02325<br>0.02545<br>0.02550<br>0.02740<br>0.0038 | 0.8325<br>0.9648<br>0.9745<br>0.9822<br>0.9860<br>0.9865<br>0.9880<br>0.9896<br>0.8060<br>0.9190<br>0.9659<br>0.9775<br>0.9800<br>0.9659<br>0.9775<br>0.9800<br>0.9815<br>0.9820<br>0.9815<br>0.9820<br>0.9830<br>0.9847<br>0.9853<br>0.9860<br>0.9874<br>0.1575<br>0.6320 | 90.1                                                                                                                                        | 18.75<br>19.35<br>22.60<br>29.38<br>30.40<br>34.45<br>41.64<br>49.14<br>58.77<br>68.65<br>74.98<br>84.61<br>88.66<br>102.84<br>107.91<br>137.80<br>167.69<br>181.07<br>195.25<br>207.21<br>217.34<br>23.406<br>35.464<br>50.460<br>74.778 | $\begin{array}{c} 0.0052\\ 0.0054\\ 0.0084\\ 0.0110\\ 0.0112\\ 0.0130\\ 0.0135\\ 0.0162\\ 0.0208\\ 0.0227\\ 0.0234\\ 0.0283\\ \hline \\ 0.0372\\ 0.0382\\ 0.0437\\ 0.0500\\ 0.0505\\ 0.0505\\ 0.0505\\ 0.0563\\ 0.0600\\ 0.0618\\ 5\\ 0.0085\\ 4\\ 0.0220\\ 0.0330\\ 8\\ 0.0535\\ \hline \end{array}$ | 0.8025<br>0.8070<br>0.8170<br>0.8500<br>0.8540<br>0.8695<br>0.9045<br>0.9165<br>0.9280<br>0.9295<br>0.9280<br>0.9295<br>0.9280<br>0.9295<br>0.9380<br>0.9415<br>0.9445<br>0.9570<br>0.9585<br>0.9610<br>0.9627<br>0.9621<br>0.9623<br>0.5225<br>0.6165<br>0.7160 |
|                                    |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              | AUXILIARY                                                                                                                                                                                                                                                                  | INFORMAT                                                                                                                                    | ION                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |
| METHOD                             |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            | SOURCE A                                                                                                                                    | ND DIDTTY                                                                                                                                                                                                                                 | OF MATERIALS.                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                  |
| Vapor<br>pump.<br>by the<br>source | recircul<br>Analys<br>ermal cor                                                                                                                                                                                                             | rUS/PROCEDURE:<br>Lated using mag<br>sis of samples<br>aductivity. I                                                                                                                                                                         | gnetic<br>of liquid<br>Details in                                                                                                                                                                                                                                          | No det                                                                                                                                      | tails giv                                                                                                                                                                                                                                 | ven.                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                  |
|                                    |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            | δT/K =<br>6 bar)<br>±0.5 (<br>to 0.0                                                                                                        | = ±0.1;<br>, ±0.1 (<br>(above 75<br>)01; δy <sub>μ</sub>                                                                                                                                                                                  | $\delta P/\text{bar} = \pm 0.0$<br>between 6 and<br>bar); $\delta x_{\text{H}} = \pm 0.0002$ t                                                                                                                                                                                                        | 1 (below<br>75 bar),<br>= ±0.0001<br>o 0.003.                                                                                                                                                                                                                    |
|                                    |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            | REFERENC                                                                                                                                    | CES:                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                  |

COMPONENTS: ORIGINAL MEASUREMENTS: Kharakhorin, F. F., Zhur. Tekh. Fiz., <u>1940</u>, 10, 1533 (Russian); Foreign Petrol. Tech., <u>1941</u>, 9, 397 (Eng. (1) Helium; He; 7440-59-7 (2) Nitrogen; N,; 7727-37-9 Trans.). Mole fraction of helium Mole fraction of helium т/к P/bar in liquid, in vapor T/K P/bar in liquid, in vapor,  $x_{\rm He}$  $x_{\rm He}$  $y_{\rm He}$  $y_{\rm He}$ 0.7685 111.5 69.91 0.0575 0.6120 107. 98.285 0.0682 0.7900 73.46 0.0612 0.6155 115.511 0.0792 0.0765 153.000 0.1012 0.8235 92.21 0.6800 111.5 19.66 0.0033 0.1390 118.04 0.0945 0.7195 0.0998 0.7315 20.47 0.0037 0.1510 122.10 22.49 0.0065 0.1925 127.16 0.1040 0.7395 135.78 0.7575 24.62 0.0080 0.1080 0.1145 142.36 28.67 0.0140 -0.7640 1 39.03 0.0275 -177.01 0.1310 0.7805 0.5070 0.0329 45.39 197.58 0.1395 0.7900 ţ, 57.00 0.0449 0.5655

| COMPONENTS .          |                   |                            |                 | ORTGINAL MEASUREMENTS .             |              |                        |                 |
|-----------------------|-------------------|----------------------------|-----------------|-------------------------------------|--------------|------------------------|-----------------|
| (1) No                | 1                 | No. 7440 E0 7              |                 | TUILU D C DOVODOU W E ond           |              |                        |                 |
| (I) He                | 11 um;            | ne; /440-59-/              |                 | Rhodes, H. L., Adv. Cryog. Engng.,  |              |                        |                 |
| (2) Ni                | trogen            | ; N <sub>2</sub> ; 7727-37 | -9              | <u>1971</u> , <i>16</i>             | , 88.        |                        |                 |
|                       |                   |                            |                 |                                     |              |                        |                 |
|                       |                   |                            |                 |                                     |              |                        |                 |
| VADTABLES             |                   |                            |                 | DDEDADED D                          | v.           |                        |                 |
| VARIADELO             | •                 |                            |                 | I KEI AKED D                        |              |                        |                 |
| Temperature, pressure |                   |                            | C. L. You       | ung                                 |              |                        |                 |
| EXPERIMENTAL VALUES:  |                   |                            | i               |                                     |              |                        |                 |
| EXIENTEN              | AL VALU           | Mole fraction              | of helium       |                                     |              | Mole fraction          | of helium       |
| т/к                   | P/bar             | in liquid,                 | in gas          | , т/к                               | P/bar        | in liquid,             | in gas,         |
|                       |                   | <sup><i>x</i></sup> He     | <sup>9</sup> He |                                     |              | <sup><i>x</i></sup> He | <sup>y</sup> He |
| 122.00                | 31.1              | 0.0064                     | 0.0480          | 123.00                              | 153.2        | 0.3400                 | 0.3400          |
|                       | 34.5              | 0.0131<br>0.0263           | 0.0893          | 123.20                              | 138.0        | 0.2558                 | 0.3756          |
|                       | 55.2              | 0.0525                     | 0.2632          | 124.00                              | 34.5         | 0.0095                 | 0.0426          |
|                       | 68.9              | 0.0774                     | 0.3319          |                                     | 41.1         | 0.0253                 | 0.1014          |
|                       | 137.8             | 0.2024                     | 0.4319          |                                     | 68.9         | 0.0926                 | 0.2504          |
|                       | 172.4             | 0.2679                     | 0.4935          |                                     | 82.7         | 0.1296                 | 0.2871          |
|                       | 193.2             | 0.3147                     | 0.4858          |                                     | 96.5         | 0.1729                 | 0.3033          |
|                       | 203.3             | 0.3476                     | 0.4699          |                                     | 106.1        | 0.2202                 | 0.2886          |
|                       | 206.7             | 0.3641                     | 0.4603          |                                     | 106.9        | 0.2267                 | 0.2834          |
|                       | 200.1             | 0.3803                     | 0.4424          |                                     | 107.5        | 0.2560                 | 0.2560          |
| 102.00                | 209.8             | 0.4075                     | 0.4075          | 124.10                              | 103.6        | 0.2163                 | 0.2788          |
| 123.00                | 34.5<br>41.4      | 0.0257                     | 0.1304          | 124.40                              | 68.8<br>68.9 | 0.0998                 | 0.2298          |
|                       | 55.2              | 0.0552                     | 0.2284          | 125.00                              | 37.7         | 0.0159                 | 0.0500          |
|                       | 68.9              | 0.0839                     | 0.2942          |                                     | 41.2         | 0.0258                 | 0.0731          |
|                       | 124.0             | 0.2056                     | 0.4051          |                                     | 68.9         | 0.1228                 | 0.1798          |
|                       | 138.1             | 0.2421                     | 0.4053          |                                     | 70.5         | 0.1360                 | 0.1737          |
|                       | 144.9             | 0.2830                     | 0.3984          | 125.05                              | 68.9         | 0.1312                 | 0.1575          |
|                       | 151.7             | 0.3107                     | 0.3678          | 125.30                              | 55.2         | 0.0744                 | 0.1310          |
|                       |                   |                            | AUXILIARY       | INFORMATION                         | 1            |                        |                 |
| METHOD /A             | זידע בסס          |                            |                 | SOURCE AND                          | DIIDITY      | OF MATERIALS.          |                 |
| Recircu               | lating            | vapor flow apr             | aratus          | 1 Duro                              | sample       | or MAILKIALS.          | occ than        |
| with be               | ryllium           | n-copper window            | ed cell.        | 10 pa                               | arts pe      | er million imp         | urity.          |
| Vapor r               | ecircul<br>Temper | lated through e            | xternal<br>with | 2. Pure sample containing less than |              |                        |                 |
| platinu               | m resis           | stance thermome            | ter and         | 50 pa                               | arts pe      | er million impu        | urity.          |
| pressure              | e measu           | red by pressur             | e trans-        |                                     |              |                        |                 |
| against               | a dead            | d weight gauge.            | Detail          | 5                                   |              |                        |                 |
| in sour               | ce.               |                            |                 |                                     |              |                        |                 |
|                       |                   |                            |                 |                                     |              |                        |                 |
| Į                     |                   |                            |                 | FOTTMATED                           | FDDOD.       |                        |                 |
|                       |                   |                            |                 | $\delta T/K = 1$                    | ±0.01:       | $\delta P/bar = \pm 0$ | 15.             |
|                       |                   |                            |                 | $\delta x_{\rm He} = \delta$        | $5y_{HO} =$  | ±0.004.                | 15,             |
|                       |                   |                            |                 |                                     |              |                        |                 |
|                       |                   |                            |                 | REFERENCES                          | 6:           |                        |                 |
| ł                     |                   |                            |                 |                                     |              |                        |                 |
|                       |                   |                            |                 |                                     |              |                        |                 |
|                       |                   |                            |                 |                                     |              |                        |                 |
|                       |                   |                            |                 |                                     |              |                        |                 |
| l                     |                   |                            |                 |                                     |              |                        |                 |

COMPONENTS: ORIGINAL MEASUREMENTS: Helium; He; 7440-59-7 (1) Tully, P. C., DeVaney, W. E., and Rhodes, H. L., Adv. Cryog. Engng., 1968, 16, 88. (2) Nitrogen; N<sub>2</sub>; 7727-37-9 Mole fraction of helium Mole fraction of helium т/к in gas, T/K P/bar in liquid, P/bar in liquid, in gas,  $x_{\rm He}$  $y_{\rm He}$  $x_{\rm He}$  $y_{\rm He}$ 125.40 37.9 0.0158 0.0416 125.80 41.4 0.0289 0.0504 41.4 0.0264 0.0635 43.1 0.0356 0.0572 44.8 0.0458 53.1 0.0690 0.1181 0.0623 55.2 0.0787 0.1228 45.4 0.0510 0.0626 0.1242 45.9 0.0898 57.2 0.0585 0.0585 57.8 0.0975 0.1201 125.90 41.4 0.0305 0.0456 57.9 0.0995 125.93 0.1190 41.4 0.0324 0.0431 58.4 0.1092 0.1092 126.00 37.0 0.0130 0.0211 125.475 55.2 0.0857 0.1116 39.3 0.0232 0.0318

39.6

0.0290

0.0290

0.0333

125.80

38.1

0.0162

| COMPONENTS:                  |                      |                                    | ORIGINAL MEASUREMENTS:                                                                              |  |  |  |
|------------------------------|----------------------|------------------------------------|-----------------------------------------------------------------------------------------------------|--|--|--|
| (l) Heli                     | um; He;              | 7440-59-7                          | Burch, R. J., J. Chem. Engng. Data                                                                  |  |  |  |
| (2) Nitr                     | ogen; N <sub>2</sub> | ; 7727-37-9                        | <u>1903</u> , 0, 191                                                                                |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
| VARIABLES:                   |                      |                                    | PREPARED BY:                                                                                        |  |  |  |
| Temperatu                    | ire, press           | sure                               | C. L. Young                                                                                         |  |  |  |
|                              |                      |                                    | -                                                                                                   |  |  |  |
| EXPERIMENTAL                 | L VALUES:            |                                    |                                                                                                     |  |  |  |
| 10 <sup>2</sup> Mole fractio |                      |                                    | n of helium                                                                                         |  |  |  |
| Т/К                          | P/bar                | in liquid,<br>$10^2 x_{\rm Hz}$    | in vapor, $10^{3}y_{}$                                                                              |  |  |  |
|                              |                      | пе                                 | ~ ne                                                                                                |  |  |  |
| 02 70                        | 5 07                 | 0 100                              | 62 0                                                                                                |  |  |  |
| 02.70                        | 10.13                | 0.268                              | 81.8                                                                                                |  |  |  |
|                              | 15.20<br>20.26       | 0.418<br>0.560                     | 87.7<br>90.5                                                                                        |  |  |  |
|                              | 30.40                | 0.825                              | 92.9                                                                                                |  |  |  |
|                              | 50.66                | 1.31                               | 94.8                                                                                                |  |  |  |
| 113.13                       | 20.26<br>25.33       | 0.340<br>0.930                     | 8.47<br>20.2                                                                                        |  |  |  |
|                              | 30.40                | 1.47                               | 28.4                                                                                                |  |  |  |
|                              | 50.66                | 3.54                               | 49.9                                                                                                |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      | AUXILIARY                          | INFORMATION                                                                                         |  |  |  |
| METHOD /APP                  | ARATUS/PR            | COCEDURE:                          | SOURCE AND PURITY OF MATERIALS:                                                                     |  |  |  |
| cally sti                    | rred cell            | . Temperature                      | better than 99.994 mole per cent.                                                                   |  |  |  |
| measured<br>pressure         | using the measured   | ermocouple and with Bourdon gauge. | 2. Airco prepurified sample purity                                                                  |  |  |  |
| Liquid an                    | d vapor s            | amples analysed                    | better than 99,997 more per cent.                                                                   |  |  |  |
| using maa                    | s spectro            | ometer.                            | (Details in source.)                                                                                |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    | ESTIMATED ERROR:                                                                                    |  |  |  |
|                              |                      |                                    | $\delta T/K = \pm 0.2$ ; $\delta P/bar = \pm 0.01$ at 5.07<br>bar, = $\pm 0.07$ at other pressures; |  |  |  |
|                              |                      |                                    | $\delta x_{\text{He}} \leq \pm 2$ % (Details in source).                                            |  |  |  |
|                              |                      |                                    | REFERENCES:                                                                                         |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |
|                              |                      |                                    |                                                                                                     |  |  |  |

| COMPONENTS     | S:                      |                     | ORIGINAL MEASUREMENTS:                                  |                                                   |  |  |  |
|----------------|-------------------------|---------------------|---------------------------------------------------------|---------------------------------------------------|--|--|--|
| (1) Hel        | Lium; He; 7             | 440-59-7            | Skripka, V. G. and Dykhno, N. M.,                       |                                                   |  |  |  |
| (2) Nit        | rogen; N <sub>2</sub> ; | 7727-37-9           | Trudy Vses. Nauch<br>Kriog. Mashinostr.                 | - <i>Issled. Inst.</i><br>, <u>1964</u> , 8, 163. |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
| VARIABLES      | :                       |                     | PREPARED BY:                                            |                                                   |  |  |  |
| Temperat       | cure, pressur           | e                   | C. L. Young                                             |                                                   |  |  |  |
| EXPERIMEN      | TAL VALUES:             |                     |                                                         |                                                   |  |  |  |
| т/к            | P/bar                   | P <sup>+</sup> /bar | Mole fracti<br>in liquid, x <sub>He</sub>               | ion of helium<br>in vapor, y <sub>He</sub>        |  |  |  |
| 67.5           | 6.08<br>11.06           | 5.82<br>10.80       | 0.00068                                                 | 0.9624<br>0.9777                                  |  |  |  |
|                | 16.08                   | 15.82               | 0.00181                                                 | 0.9841                                            |  |  |  |
|                | 21.20                   | 20.93               | 0.00242                                                 | 0.9874                                            |  |  |  |
| 72.0           | 6.17                    | 5.63                | 0.00086                                                 | 0.9214                                            |  |  |  |
|                | 11.12                   | 10.58               | 0.00167                                                 | 0.9550                                            |  |  |  |
|                | 16.13                   | 15.59               | 0.00243                                                 | 0.9677                                            |  |  |  |
| 1              | 26.08                   | 25.54               | 0.00397                                                 | 0.9783                                            |  |  |  |
| 78.0           | 6.02                    | 4.88                | 0.00104                                                 | 0.8144                                            |  |  |  |
|                | 11.05                   | 9.92                | 0.00211                                                 | 0.8999                                            |  |  |  |
|                | 21.19                   | 20.05               | 0.00416                                                 | 0.9452                                            |  |  |  |
|                | 26.22                   | 25.09               | 0.00521                                                 | 0.9536                                            |  |  |  |
| 84.0           | 11.06                   | 3.98                | 0.00114                                                 | -<br>0.7967                                       |  |  |  |
|                | 16.18                   | 14.09               | 0.00402                                                 | 0.8611                                            |  |  |  |
|                | 21.19                   | 19.10               | 0.00536                                                 | 0.8905                                            |  |  |  |
| 90.3           | 26.20                   | 24.12               | 0.00089                                                 | -                                                 |  |  |  |
|                | 11.06                   | 7.29                | 0.00277                                                 | -                                                 |  |  |  |
|                | 16.13                   | 12.35               | 0.00470                                                 | 0.7392                                            |  |  |  |
|                | 26.25                   | 22.47               | 0.00856                                                 | 0.8345                                            |  |  |  |
| P <sup>+</sup> | partial pres            | sure of helium.     |                                                         |                                                   |  |  |  |
| ļ              |                         | AUXILIARY           | INFORMATION                                             |                                                   |  |  |  |
| METHOD /A      | APPARATUS/PRO           | CEDURE:             | SOURCE AND PURITY OF MATERIALS:                         |                                                   |  |  |  |
| Vapor fl       | ow apparatus            | with magnetic re-   | 1. High purity containing no more                       |                                                   |  |  |  |
| circulat       | ing pump.               | Temperature measu-  | nitrogen, 0.005%                                        | ogen, 0.02%                                       |  |  |  |
| meter, p       | ressure meas            | ured with Bourdon   | hydrocarbons.                                           | onggen and otoro                                  |  |  |  |
| gauge.         | Samples of              | gas and liquid      | 2. Purity 99.5 mole                                     | e per cent, oxygen                                |  |  |  |
| Details        | in source.              | e interferometry.   | main impurity.                                          | • • • • • •                                       |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
| 1              |                         |                     | ESTIMATED ERROR:                                        |                                                   |  |  |  |
|                |                         |                     | $\int \frac{\partial T}{K} = \pm 0.02 \text{ to } 0.03$ | $\approx +0.0001 + 0$                             |  |  |  |
|                |                         |                     | 10 00002 <sup>00</sup> He <sup>- 09</sup> H             | e _0.00001 CO                                     |  |  |  |
| 1              |                         |                     |                                                         |                                                   |  |  |  |
| 1              |                         |                     | REFERENCES:                                             |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
| 1              |                         |                     |                                                         |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
|                |                         |                     |                                                         |                                                   |  |  |  |
| 1              |                         |                     |                                                         |                                                   |  |  |  |

| CONTROL        |                            |                   |                                                       |                                                            |  |
|----------------|----------------------------|-------------------|-------------------------------------------------------|------------------------------------------------------------|--|
| COMPON         | ENTS:                      |                   | ORIGINAL MEASUREMENTS:                                |                                                            |  |
| (1)            | Helium; He; 74             | 40-59-7           | Rodewald, N. C., Davis, J. A. and                     |                                                            |  |
| (2)            | Nitrogen; N <sub>2</sub> ; | 7727-37-9         | J., <u>1964</u> , 10,                                 | 937. 937.                                                  |  |
| [              |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
| VARIAB         | LES:                       | -t <sup></sup>    | PREPARED BY:                                          |                                                            |  |
| Tomn           | orature pressure           |                   |                                                       |                                                            |  |
| 1.05           | eracure, problare          |                   | C. D. Toung                                           |                                                            |  |
| EXPERI         | MENTAL VALUES:             |                   |                                                       |                                                            |  |
|                | - 4                        | Mole fraction     | n of helium                                           |                                                            |  |
| T/K            | <i>P</i> /bar              | in liquid,        | in gas,<br><sup>y</sup>                               |                                                            |  |
|                |                            | не                | ° He                                                  |                                                            |  |
| 77.2           | 13.8                       | 0.0031            | 0.920                                                 |                                                            |  |
|                | 27.6                       | 0.0062            | 0.955                                                 |                                                            |  |
|                | 41.4<br>55.2               | 0.0091<br>0.01175 | 0.968<br>0.975                                        |                                                            |  |
| 60 2           | 68.9                       | 0.0138            | 0.979                                                 |                                                            |  |
| 09.3           | 27.6                       | 0.0046            | 0.980                                                 |                                                            |  |
|                | 41.4                       | 0.0066<br>0.0083  | 0.983<br>0.985                                        |                                                            |  |
|                | 68.9                       | 0.0095            | 0.988                                                 |                                                            |  |
| 64.9           | 27.6                       | 0.00365           | 0.981                                                 |                                                            |  |
|                | 41.4<br>55.2               | 0.0051<br>0.0063  | 0.985<br>0.988                                        |                                                            |  |
|                | 68.9                       | 0.0073            | 0.992                                                 |                                                            |  |
|                |                            |                   |                                                       | -                                                          |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            | AUXTLTARY         | INFORMATION                                           |                                                            |  |
| METHOD         | /APPARATUS /PROCED         | COURCE AND DUDITY | OF NATEDIALS.                                         |                                                            |  |
| Stati          | .c equilibrium cel         | l temperature     | No details giv                                        | en.                                                        |  |
| measu          | red with platinum          | 1 resistance      |                                                       |                                                            |  |
| with           | Bourdon gauge.             | Dew and bubble    |                                                       |                                                            |  |
| point<br>compo | s measured for sa          | mples of known    |                                                       |                                                            |  |
| 00             |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   | ESTIMATED ERROR:                                      |                                                            |  |
|                |                            |                   | $\delta T/K = \pm 0.7;$<br>$\delta x_{} = \pm 0.0005$ | $\delta P/bar = \pm 0.5\%;$<br>; $\delta y_{} = \pm 0.002$ |  |
|                |                            |                   | не                                                    | Сне                                                        |  |
|                |                            |                   | REFERENCES:                                           |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |
|                |                            |                   |                                                       |                                                            |  |

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COMPONENTS: ORIGINAL MEASUREMENTS: (1) Helium; He; 7440-59-7 Davis, J. A., Rodewald, N. and Kurata, F., Ind. Eng. Chem., 1963, 55 (2) Nitrogen; N<sub>2</sub>; 7727-37-9 No.11, 36. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young **EXPERIMENTAL VALUES:** Mole fraction of helium Mole fraction of helium in gas, T/K P/bar in liquid, T/K P/bar in liquid, in gas,  $^{y}{}_{\mathrm{He}}$  $x_{\rm He}$  $y_{\text{He}}$  $x_{\text{He}}$ 77.2 77.2 14.4 0.0031 51.4 0.0105 0.956 -0.0112 0.977 0.0041 51.4 17.9 \_ 29.1 0.0067 -56.4 0.0109 0.981 29.1 0.974 56.4 0.0072 0.0112 0.945 36.2 0.0080 56.5 0.0124 0.962 56.5 36.2 0.0084 0.968 0.0129 0.975 0.0117 36.5 0.0093 0.947 60.8 0.989 36.5 0.0102 0.967 60.8 0.0120 0.974 0.0086 62.6 0.946 0.974 42.6 0.0124 42.6 0.0090 0.966 62.6 0.0131 0.975 0.0099 44.3 0.949 67.4 0.0129 0.977 44.3 0.973 0.0108 67.4 0.0133 0.974 49.7 0.0098 0.951 68.1 0.0134 0.981 0.976 49.7 0.974 0.0101 68.1 0.0146 AUXILIARY INFORMATION METHOD / APPARATUS / PROCEDURE : SOURCE AND PURITY OF MATERIALS: Static equilibrium cell temperature No details given. measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Composition of vapor and liquid phases estimated from overall composition and amount of each phase. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.5; \quad \delta P/bar = \pm 0.2;$  $\delta x_{\text{He}} = \pm 0.0002; \quad \delta y_{\text{He}} = \pm 0.002$ (estimated by compiler) **REFERENCES:** 

|                                          |               |                                 |                                                            | ·                                                                                               |                |                            |                          |  |  |  |  |  |  |  |
|------------------------------------------|---------------|---------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------|----------------------------|--------------------------|--|--|--|--|--|--|--|
| COMPONENTS:                              |               |                                 | ORIGINAL MEASUREMENTS:                                     |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| (1) Helium; He; 7440-59-7                |               |                                 | Streett, W. B., Chem. Eng. Prog.                           |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| (2) Nitrogen; N <sub>2</sub> : 7727-37-9 |               |                                 | Symp. Ser. No. 61, <u>1967</u> , 63, 37.                   |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| VARIABI                                  | .es:          |                                 |                                                            | PREPARED BY:                                                                                    |                |                            |                          |  |  |  |  |  |  |  |
| Temperature, pressure                    |               |                                 | С. L. Y                                                    | oung                                                                                            |                |                            |                          |  |  |  |  |  |  |  |
| EXPERIMENTAL VALUES:                     |               |                                 | 1                                                          |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| т/к                                      | <i>P/</i> bar | Mole fraction in liquid,        | of helium<br>in vapor,                                     | т/к                                                                                             | P/bar          | Mole fractio<br>in liquid, | n of helium<br>in vapor, |  |  |  |  |  |  |  |
| ĺ                                        |               | x <sub>He</sub>                 | <sup>y</sup> <sub>He</sub>                                 | ,                                                                                               | •              | <sup>x</sup> He            | <sup>y</sup> He          |  |  |  |  |  |  |  |
| 77.60                                    | 66.9          | 0.0123                          | 0.9784                                                     | 117.13                                                                                          | 485.7          | 0.3577                     | 0.7729                   |  |  |  |  |  |  |  |
|                                          | 143.6         | 0.0235                          | 0.9866                                                     |                                                                                                 | 553.6          | 0.3750                     | 0.7833                   |  |  |  |  |  |  |  |
|                                          | 209.3         | 0.0310                          | 0.9906                                                     |                                                                                                 | 681.9          | 0.3880                     | 0.8024                   |  |  |  |  |  |  |  |
|                                          | 341.6         | 0.0426                          | 0.9893                                                     | 119.60                                                                                          | 70.3           | 0.0710                     | 0.4243                   |  |  |  |  |  |  |  |
|                                          | 417.1         | 0.0474                          | 0.9904                                                     |                                                                                                 | 137.9          | 0.1635                     | 0.5780                   |  |  |  |  |  |  |  |
|                                          | 482.6         | 0.0513                          | 0.9910                                                     |                                                                                                 | 205.1          | 0.2415                     | 0.6288                   |  |  |  |  |  |  |  |
|                                          | 550.9         | 0.0540                          | 0.9910                                                     |                                                                                                 | 275.L          | 0.3127                     | 0.6523                   |  |  |  |  |  |  |  |
| 100.61                                   | 68.2          | 0.0347                          | 0.8211                                                     |                                                                                                 | 349.2          | 0.3760                     | 0.6626                   |  |  |  |  |  |  |  |
|                                          | 137.2         | 0.0672                          | 0.8863                                                     |                                                                                                 | 380.9          | 0.4010                     | 0.6653                   |  |  |  |  |  |  |  |
|                                          | 206.5         | 0.0932                          | 0.9072                                                     |                                                                                                 | 416.4          | 0.4250                     | 0.6631                   |  |  |  |  |  |  |  |
|                                          | 272.7         | 0.1138                          | 0.9188                                                     |                                                                                                 | 481.3          | 0.4607                     | 0.6670                   |  |  |  |  |  |  |  |
|                                          | 343.0         | 0.1445                          | 0.9295                                                     |                                                                                                 | 579.2          | 0.4854                     | 0.6790                   |  |  |  |  |  |  |  |
|                                          | 481.6         | 0.1562                          | 0.9351                                                     |                                                                                                 | 630.2          | 0.5047                     | 0.6909                   |  |  |  |  |  |  |  |
|                                          | 552.3         | 0.1665                          | 0.9376                                                     |                                                                                                 | 679.1          | 0.5080                     | 0.7055                   |  |  |  |  |  |  |  |
|                                          | 606.4         | 0.1718                          | 0.9411                                                     | 119.80                                                                                          | 372.0          | 0.4090                     | 0.6500                   |  |  |  |  |  |  |  |
| 117 13                                   | 67 6          | 0.1//5                          | 0.9418                                                     |                                                                                                 | 455.4          | 0.4670                     | 0.64//                   |  |  |  |  |  |  |  |
| 11/013                                   | 137.9         | 0.1404                          | 0.6473                                                     |                                                                                                 | 516.8          | 0.5037                     | 0.6419                   |  |  |  |  |  |  |  |
|                                          | 214.1         | 0.2101                          | -                                                          |                                                                                                 | 550.5          | 0.5207                     | 0.6398                   |  |  |  |  |  |  |  |
|                                          | 282.7         | 0.2616                          | 0.7208                                                     |                                                                                                 | 603.3          | 0.5321                     | 0.6478                   |  |  |  |  |  |  |  |
|                                          | 352.7         | 0.3019                          | 0.7480                                                     | 119.86                                                                                          | 689.1<br>500.2 | 0.5310                     | 0.6815                   |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| AUXILIARY INFORMATION                    |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| METHOD/APPARATUS/PROCEDURE:              |               |                                 | SOURCE AND PURITY OF MATERIALS;                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| Reciro                                   | Samp          | g vapor flow v<br>les of phases | analysed by                                                | no d                                                                                            | etails g       | given.                     |                          |  |  |  |  |  |  |  |
| therm                                    | al cond       | uctivity. Te                    | emperature                                                 |                                                                                                 | •              |                            |                          |  |  |  |  |  |  |  |
| measu                                    | red wit       | h platinum rea                  | sistance                                                   |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| therm                                    | ometer.       | Pressure m                      | easured with                                               |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| Bourde                                   | on gaug       | e. Details :                    | in source                                                  |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
| and re                                   | 31. 1.        |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            | ESTIMATED ERROR:<br>$\delta \pi / K = \pm 0.02$ ; $\delta P / har = \pm 0.1$ ; $\delta \pi = -$ |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 | $o_{T/K} = 1$                                              | $51/K = 10.02; $ $6P/Bar = 10.1; $ $6x_{He} =$                                                  |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 | <pre>\$y<sub>He</sub> = ±0.002 to ±0.01 (at pressure</pre> |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |
|                                          |               |                                 |                                                            |                                                                                                 |                |                            |                          |  |  |  |  |  |  |  |

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N<sub>2</sub>; 7727-37-9

# ORIGINAL MEASUREMENTS:

Streett, W. B., Chem. Eng. Prog. Symp. Ser. No. 61, <u>1967</u>, 63, 37.

EXPERIMENTAL VALUES:

|        |               | Mole fraction   | of helium       | | | | | |
|---|---|---|---|---|---|---|---|---|
| Т/К    | <i>P/</i> bar | in liquid,      | in vapor,       |
|        |               | <sup>x</sup> He | <sup>y</sup> He |
| 119.86 | 507.1         | 0.5150          | 0.6244          |
|        | 515.7         | 0.5188          | 0.6274          |
|        | 524.3         | 0.5240          | 0.6268          |
|        | 534.7         | 0.5345          | 0.6219          |
|        | 540.9         | 0.5340          | 0.6278          |
|        | 552.6         | 0.5382          | 0.6270          |
|        | 589.2         | 0.5435          | 0.6283          |
|        | 580.9         | 0.5453          | 0.6331          |
|        | 606.0         | 0.5514          | 0.6320          |
|        | 655.7         | 0.5482          | -               |
|        | 689.5         | 0.5470          | 0.6686          |
|        | 757.0         | 0.5351          | 0.7001          |
|        | 827.4         | 0.5269          | 0.7302          |
| 119.92 | 221.7         | 0.2732          | 0.6261          |
|        | 277.9         | 0.3312          | 0.6393          |
|        | 348.9         | 0.3980          | 0.6449          |
|        | 415.8         | 0.4513          | 0.6379          |
|        | 449.9         | 0.4799          | 0.6349          |
|        | 484.7         | 0.5093          | 0.6223          |
|        | 503.7         | 0.5556          | 0.5940          |
|        | 669.9         | 0.5841          | 0.6343          |
|        | 680.9         | 0.5704          | 0.6524          |
|        | 690.9         | 0.5671          | 0.6587          |
|        | 758.4         | 0.5470          | 0.6977          |
| 120.40 | 830.8         | 0.5354          | 0.7261          |
|        | 205.8         | 0.2616          | 0.5970          |
|        | 310.3         | 0.3915          | 0.6051          |
|        | 342.7         | 0.4377          | 0.5890          |
| 121.00 | 357.8         | 0.4665          | 0.5769          |
|        | 67.6          | 0.0707          | 0.3628          |
|        | 145.5         | 0.1937          | 0.5373          |
|        | 206.5         | 0.2837          | 0.5686          |
| 121.74 | 276.8         | 0.4039          | 0.5478          |
|        | 290.3         | 0.4743          | 0.5108          |
|        | 67.2          | 0.0729          | 0.3356          |
|        | 112.0         | 0.1522          | 0.4624          |
|        | 146.9         | 0.2109          | 0.5039          |
|        | 203.1         | 0.3120          | 0.5152          |
|        | 214.8         | 0.3476          | 0.5020          |
|        | 221.3         | 0.3680          | 0.4964          |
|        | 224.1         | 0.3883          | 0.4896          |
| COMPONENTS:                       |                        |                             |                            | ORIGINAL MEASUREMENTS:                                       |                   |                                  |                       |  |
|-----------------------------------|------------------------|-----------------------------|----------------------------|--------------------------------------------------------------|-------------------|----------------------------------|-----------------------|--|
| (1) Helium; He; 7440-59-7         |                        |                             |                            | DeVaney                                                      | , W. E.           | , Dalton, B.                     | J. and                |  |
| (2) $Nitrogen, N = 7727 - 27 - 0$ |                        |                             |                            | Meeks,                                                       | J. C. J           | Ir., J. Chem.                    | Engng.                |  |
| (2) Nitrogen; $N_2$ ; 7727-37-9   |                        |                             |                            | Data, 1                                                      | L963, <i>8</i> ,  | 473.                             | 0 0                   |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
| VARIAB                            | LES:                   |                             |                            | PREPARED                                                     | BY:               |                                  |                       |  |
| Tempe                             | rature, p              | ressure                     |                            | С. L. У                                                      | loung             |                                  |                       |  |
| -                                 |                        |                             |                            |                                                              |                   |                                  |                       |  |
| EXPERI                            | MENTAL VAL             | UES:                        |                            | <u> </u>                                                     |                   |                                  |                       |  |
| т/к                               | P/bar i                | ole fraction<br>n liquid,   | in gas,                    | т/к                                                          | <i>P/</i> bar     | Mole fraction<br>in liquid,      | of helium<br>in gas,  |  |
| ,                                 | ·                      | <sup>x</sup> He             | y <sub>He</sub>            | ·                                                            | ·                 | <sup>x</sup> <sub>He</sub>       | y <sub>He</sub>       |  |
| 76.5                              | 13.9                   | 0.00265                     | 0.9111                     | 85.0                                                         | 82.9              | 0.0223                           | 0.9578                |  |
|                                   | 27.7                   | 0.0034                      | 0.9573                     |                                                              | 96.3              | 0.0248                           | 0.9626                |  |
| ļ                                 | 41.4<br>55 7           | 0.0062                      | 0.9702                     |                                                              | 111.0             | 0.0290                           | 0.9626                |  |
|                                   | 69.1                   | 0.0107                      | 0.9796                     |                                                              | 137.8             | 0.0359                           | 0.9683                |  |
|                                   | 83.2                   | 0.0131                      | 0.9832                     | 90.0                                                         | 13.9              | 0.0041                           | 0.6962                |  |
|                                   | 96.2                   | 0.0152                      | 0.9826                     |                                                              | 27.7              | 0.0097                           | 0.8395                |  |
|                                   | 124.1                  | 0.0192                      | 0.9844                     |                                                              | 55.4              | 0.0183                           | 0.9135                |  |
|                                   | 138.3                  | 0.0213                      | 0.9859                     |                                                              | 68.9              | 0.0224                           | 0.9232                |  |
| 80.0                              | 13.9                   | 0.0031                      | 0.8793                     |                                                              | 82.8              | 0.0280                           | 0.9336                |  |
|                                   | 41.3                   | 0.0075                      | 0.9576                     |                                                              | 110.8             | 0.0381                           | 0.9451                |  |
|                                   | 55.6                   | 0.0114                      | 0.9652                     |                                                              | 123.9             | 0.0412                           | 0.9467                |  |
|                                   | 69.0<br>83.2           | 0.0136                      | 0.9702                     | 95 0                                                         | 137.9             | 0.0458                           | 0.9511                |  |
|                                   | 96.2                   | 0.0189                      | 0.9769                     | 93.0                                                         | 27.8              | 0.0109                           | 0.7703                |  |
|                                   | 110.5                  | 0.0215                      | 0.9771                     |                                                              | 41.7              | 0.0165                           | 0.8339                |  |
|                                   | 124.2                  | 0.0244                      | 0.9769                     |                                                              | 55.4              | 0.0220                           | 0.8671                |  |
| 85.0                              | 13.9                   | 0.0039                      | 0.8088                     |                                                              | 83.0              | 0.0341                           | 0.9008                |  |
|                                   | 27.9                   | -                           | 0.8990                     |                                                              | 96.4              | 0.0404                           | 0.9118                |  |
|                                   | 41.6                   |                             | 0.9282                     |                                                              | 110.5             | 0.0464                           | 0.9214                |  |
|                                   | 69.1                   | 0.0175                      | 0.9503                     |                                                              | 137.6             | 0.0561                           | 0.9300                |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             | AUXILIARY                  | INFORMAT                                                     | ION               |                                  |                       |  |
| METHOD                            | )/APPARAT              | US/PROCEDURE                | :                          | SOURCE A                                                     | ND PURIT          | Y OF MATERIALS:                  | .                     |  |
| Window<br>stirre                  | wed equil<br>er and co | ibrium cell<br>pper constan | titted with<br>tan thermo- | <ol> <li>Minimum purity 99.995 mole per<br/>cent.</li> </ol> |                   |                                  |                       |  |
| couple                            | e. Pres                | sure measure                | d by dead                  | 2. Minimum purity by mass spectrometry                       |                   |                                  |                       |  |
| phases                            | s analvse              | d using gas                 | chromato-                  | 99.9 mole per cent.                                          |                   |                                  |                       |  |
| graphy                            | y. Deta                | ils in sourc                | e.                         |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            | ESTIMATE                                                     | ED ERROR:         |                                  | 1                     |  |
|                                   |                        |                             |                            | δТ/К =                                                       | ±0.5;             | $\delta P/bar = \pm 0.0^{\circ}$ | 7; $\delta x_{112} =$ |  |
|                                   |                        |                             |                            | ±0.002                                                       | for x             | > 0.01, ±0.00                    | 03 for x              |  |
|                                   |                        |                             |                            | < 0.01.                                                      | Те<br>δ <i>u_</i> | = ±0.002.                        | Не                    |  |
|                                   |                        |                             |                            | REFERENC                                                     | CES:              |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
| l                                 |                        |                             |                            |                                                              |                   |                                  |                       |  |
| l                                 |                        |                             |                            |                                                              |                   |                                  |                       |  |
|                                   |                        |                             |                            |                                                              |                   |                                  |                       |  |
| l                                 |                        |                             |                            |                                                              |                   |                                  |                       |  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Helium; He; 7440-59-7 DeVaney, W. E., Dalton, B. J. and Meeks, J. C. Jr., J. Chem. Engng. (2) Nitrogen; N<sub>2</sub>; 7727-37-9 Data, 1963, 8, 473. EXPERIMENTAL VALUES: Mole fraction of helium T/K P/bar in liquid, in gas,  $x_{\rm He}$  $y_{\rm He}$ 100.0 0.0045 14.1 0.3586 27.6 0.6294 0.0197 41.5 0.7576 0.0275 55.3 0.8106 68.4 0.0345 0.8370 82.7 0.0438 0.8591 96.3 0.0507 0.8677 110.7 0.0586 0.8830 123.9 0.0627 0.8840 138.4 0.0684 0.8933 105.0 14.1 0.0027 0.1671 27.6 0.0104 0.4957 41.5 0.0213 0.6330 55.5 0.0315 0.7139 68.9 0.0412 0.7597 0.0519 83.2 0.8086 96.9 0.0613 0.8252 110.5 0.0726 0.8309 124.0 0.0760 0.8379 138.0 0.0828 0.8478 110.0 27.6 0.0103 0.3400 41.6 0.0241 0.5071 55.4 0.0375 0.6084 69.0 0.0496 0.6672 82.8 0.0619 0.6964 96.7 0.0731 0.7350 110.7 0.0820 0.7729 124.5 0.0904 0.7883 138.1 0.0983 0.7940 0.0102 115.0 27.6 0.1860 41.5 0.0252 0.3694 0.4712 55.2 0.0437 69.6 0.0597 0.5524 82.7 0.0723 0.6109 96.7 0.0860 0.6489 110.7 0.0962 0.6771 124.3 0.1051 0.6993 138.2 0.1068 0.7201 120.0 41.5 0.0253 0.2211 55.6 0.0495 0.3465 69.5 0.0749 0.4197 82.7 0.0915 0.4874 96.5 0.1026 0.5210 110.6 0.1190 0.5623 0.1300 0.1404 124.0 0.5813 138.1 0.6052

| COMPONENTS :                                                                                                      | ORIGINAL MEASUREMENTS:                                                                                                                                                                                                                                |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| (1) Helium; He; 7440-59-7                                                                                         | Gonikberg, M. G. and Fastowsky, W. G.,<br>Acta Physicochimica U.R.S.S., <u>1940</u> ,                                                                                                                                                                 |  |  |  |  |
| (2) Nitrogen; N <sub>2</sub> ; 7727-37-9                                                                          | 12, 67.                                                                                                                                                                                                                                               |  |  |  |  |
| VARIABLES:                                                                                                        | PREPARED BY:                                                                                                                                                                                                                                          |  |  |  |  |
| Temperature, pressure                                                                                             | C. L. Young                                                                                                                                                                                                                                           |  |  |  |  |
| EXPERIMENTAL VALUES:                                                                                              |                                                                                                                                                                                                                                                       |  |  |  |  |
| Mole fraction of heliu<br>T/K P/bar in liquid, in vapor<br><sup>x</sup> He <sup>y</sup> He                        | m Mole fraction of helium<br>, T/K P/bar in liquid, in vapor,<br><sup>x</sup> He <sup>y</sup> He                                                                                                                                                      |  |  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                              | $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                  |  |  |  |  |
| AUXILIAR                                                                                                          | Y INFORMATION                                                                                                                                                                                                                                         |  |  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>Recirculating vapor flow apparatus.<br>Method described in ref. 1. and<br>source. | SOURCE AND PURITY OF MATERIALS:<br>No details given.                                                                                                                                                                                                  |  |  |  |  |
|                                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 1;  \delta x_{He} \approx \delta y_{He} = \pm 0.001 \text{ (compiler)}.$<br>REFERENCES:<br>1. Sokolov, V. A., "Methods for<br>investigating nature gases", <u>1932</u> ,<br>(Russian). |  |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Parrish, W. R. and Stewart, W. G., (1) Helium; He; 7440-59-7 J. Chem. Engng. Data, 1975, 20, 412. (2) Nitrous oxide; N<sub>2</sub>O; 10024-97-2 VARIABLES: PREPARED BY: C. L. Young Temperature, pressure . EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium T/K P/bar in liquid, in vapor, T/K P/bar in liquid, in vapor <sup>х</sup>не <sup>у</sup>не  $x_{\text{He}}$  ${}^{y}$ He 0.0052 195.0 103.3 \_ 255.0 86.7 0.0147 \_ 103.6 0,0052 -87.4 0.0154 -0.0070 -136.4 101.8 0.0186 -137.8 0.0068 -103.0 0.0182 \_ \_ 215.0 49.9 0.0029 103.2 0.0180 \_ 104.5 51.8 0.0027 0.0184 \_ 86.1 0.0054 -104.7 0.0185 235.0 51.2 0.0056 121.2 -0.0209 \_ 51.6 0.0055 121.7 0.0214 -84.8 0.0096 133.2 0.0241 -86.2 0.0104 135.4 0.0246 --136.5 0.0170 136.2 0.0242 245.0 265.0 52.5 71.0 0.0098 0.0077 103.2 0.0157 52.8 0.0075 \_ 103.7 0.0155 71.6 0.0127 --131.3 0.0204 71.7 0.0128 0.0205 133.9 \_ 72.1 0.0122 137.6 0.0209 -104.9 0.0215 -137.8 0.0209 105.5 0.0222 -255.0 38.8 0.0042 135.4 0.0291 \_ -38.9 0.0041 136.8 0.0299 \_ 58.2 0.0087 285.0 0.0173 81.8 94.3 58.3 0.0090 0.0238 75.6 0.0127 -94.6 0.0233 \_ 114.6 0.0177 76.0 0.0130 86.1 0.0145 -116.9 0.0334 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD /APPARATUS/PROCEDURE: Vapor recirculation system similar to 1. No details given. that in ref. 1. Pressure measured 2. Purity better than 98 mole per with Bourdon gauge. Temperature cent. Vapor over liquid vented measured with platinum resistance several times. thermometer. Samples of liquid and vapor analysed by gas chromatography. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.13; \quad \delta P/bar = \pm 0.07;$  $\delta x_{\text{He}} = \delta y_{\text{He}} = \pm 0.002 \text{ or } \pm 2\% \text{ which-}$ ever is greater. **REFERENCES**:

|             |               |                 | I         |         |               |                                |             |
|-------------|---------------|-----------------|-----------|---------|---------------|--------------------------------|-------------|
| COMPONENTS: |               |                 |           | ORIGIN  | AL MEASU      | JREMENTS:                      |             |
| (1)         | Helium;       | He; 7440-59-7   |           | Parris  | h, W. R.      | and Stewart,                   | W. G.,      |
| (2)         | Nitrous       | Oxide; N2O; 100 | 24-97-2   | e. chei | ". Engng      | <i>J. Data</i> , <u>1975</u> , | 20, 412.    |
|             |               |                 |           |         |               |                                |             |
|             |               |                 |           |         |               |                                |             |
|             |               |                 |           |         |               |                                |             |
|             | - 4           | Mole fraction   | of helium |         |               | Mole fraction                  | of helium   |
| т/к         | <i>P/</i> bar | in liquid,      | in vapor, | T/K     | <i>P/</i> bar | in liquid,                     | in vapor    |
|             |               | $x_{\rm He}$    | $^{y}$ He |         |               | <sup>x</sup> He                | ${}^{y}$ He |
| 285.0       | 135.5         | 0.0414          | -         | 245.0   | 98.2          | -                              | 0.8211      |
|             | 136.1         | 0.0416          | -         |         | 125.9         | -                              | 0.8558      |
|             | 136.7         | 0.0418          | -         | 255.0   | 50.0          | -                              | 0.5611      |
| 235.0       | 19.7          | -               | 0.4563    |         | 70.1          | -                              | 0.6628      |
|             | 35.6          | -               | 0.6855    |         | 103.8         | -                              | 0.7630      |
|             | 52.0          | -               | 0.7775    |         | 128.5         | -                              | 0.8042      |
|             | 69.3          | -               | 0.8269    | 265.0   | 41.6          | -                              | 0.3128      |
|             | 104.5         | -               | 0.0022    |         | 12.5          | -                              | 0.5674      |
| 245 0       | 10 2          | -               | 0.9055    |         | 90.J          | -                              | 0.0028      |
| 243.0       | 40.J          | -               | 0.6780    |         | 106 0         | -                              | 0.6828      |
|             | 67.6          | -               | 0.7470    |         | 136.5         | -                              | 0.7403      |
|             |               |                 |           |         |               |                                |             |

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EVALUATOR:
COMPONENTS:
 1. Helium; He; 7440-59-7
                                          Colin Young,
                                          School of Chemistry,
 2. Oxygen; O<sub>2</sub>; 7782-44-7
                                          University of Melbourne,
                                          Parkville, Victoria 3052,
                                          AUSTRALIA.
CRITICAL EVALUATION:
           There are few sets of data for this system.
                                                           Herring and
Barrick(1) did not present tabulated data but gave the following smoothing
equations for the mole fraction solubility
                   x = D(P - P_{c}) + E(P - P_{c})^{2}
where P is the total pressure in units of atmosphere; P_{c} is the vapor
 pressure of oxygen in units of atmosphere and D and E are constants given
 in Table 1.
 Table 1. Constants given by Herring and Barrick (1)
                          10<sup>3</sup>D
                                             -10<sup>6</sup>E
          т/к
           70
                       2.4356943
                                         1.6908251
           76
                       4.0101437
                                          4.0894999
           90
                       8.8673682
                                         7.0547135
          110
                     23.268528
                                         20.804676
          130
                     51.895458
                                         46.479906
          144
                     97.089510
                                       103.08746
          150
                    135.87904
                                         74.331705
In view of the lack of information regarding the degree of fit of such
smoothing equations, these data should be regarded with some caution and
are classified as doubtful.
```

The three other sets of data are all in reasonable agreement in the overlapping ranges of temperature and pressure. The solubility values of Skripka and Lobonova (2) are slightly greater than the values of Sinor and Kurata (3) at the highest pressures studied by the latter. The data of Skripka and coworker (2) and (4) and of Sinor and Kurata (3) are classified as tentative.

## References

- Herring, R. N. and Barrick, P. L., Internat. Adv. Cryogenic Engng., <u>1964</u>, 10, 151.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., 1971, 13, 90.
- 3. Sinor, J. E. and Kurata, F., J. Chem. Engng. Data, <u>1966</u>, 11, 537.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn., <u>1964</u>, 8, 163

| COMPONE                                                                                                                                                                                                                                                                                 | NTS :                                                                                                                                                                                                                  | · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ······································                                                      | ORIGIN                                                                                                                 |                                                                                                                                                                                                                         | MENTS .                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre>(1) Helium; He; 7440-59-7 (2) Oxygen; O<sub>2</sub>; 7782-44-7</pre>                                                                                                                                                                                                               |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             | Skripka, V. G. and Lobonova, N. N.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinostr., <u>1971</u> , 13, 90.     |                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| VARIABL                                                                                                                                                                                                                                                                                 | ES:                                                                                                                                                                                                                    | - <u></u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             | PREPARI                                                                                                                | ED BY:                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| Temp                                                                                                                                                                                                                                                                                    | erature,                                                                                                                                                                                                               | pressure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                             | с. г.                                                                                                                  | Young                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| EXPERIM                                                                                                                                                                                                                                                                                 | ENTAL VAL                                                                                                                                                                                                              | UES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                             |                                                                                                                        |                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| т/к                                                                                                                                                                                                                                                                                     | P/bar                                                                                                                                                                                                                  | Mole fraction<br>in liquid,<br><sup>°</sup> He                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | of helium<br>in vapor,<br><sup>y</sup> He                                                   | т/к                                                                                                                    | P/bar                                                                                                                                                                                                                   | Mole fracti<br>in liquid,<br><sup>x</sup> He                                                                                                                                                                                                                                         | ion of helium<br>in vapor,<br><sup>y</sup> He                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| 65.12                                                                                                                                                                                                                                                                                   | 9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>107.9<br>117.7<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>215.7<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0 | 0.0002<br>0.0003<br>0.0004<br>0.0005<br>0.0008<br>0.0010<br>0.0013<br>0.0015<br>0.0016<br>0.0018<br>0.0020<br>0.0021<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0026<br>0.0034<br>0.0034<br>0.0004<br>0.0015<br>0.0015<br>0.0015<br>0.0012 | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | 90.58                                                                                                                  | 58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>215.7<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3 | 0.0023<br>0.0027<br>0.0031<br>0.0041<br>0.0046<br>0.0050<br>0.0055<br>0.0058<br>0.0062<br>0.0066<br>0.0070<br>0.0074<br>0.0079<br>0.0083<br>0.0087<br>0.0083<br>0.0087<br>0.0092<br>0.0006<br>0.0014<br>0.0021<br>0.0029<br>0.0037<br>0.0045<br>0.0054<br>0.0054<br>0.0062<br>0.0070 | 0.9925<br>0.9935<br>0.9940<br>0.9945<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.99700<br>0.99700<br>0.99750 |  |
|                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | AUXILIARY                                                                                   | INFORMA                                                                                                                | TION                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| METHOD/APPARATUS/PROCEDURE:<br>Rocking autoclave partially filled<br>with liquid and then pressurized with<br>gas. Samples of phases analysed by<br>interferometry. Temperature measured<br>with platinum resistance and pressure<br>measured with Bourdon gauge. Details<br>in source. |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SOURCE<br>1. H<br>m<br>2. H<br>m                                                            | AND PURIT<br>igh puri<br>ole per<br>igh puri<br>ole per                                                                | Y OF MATERIALS<br>ty sample;<br>cent.<br>ty sample;<br>cent.                                                                                                                                                            | :<br>purity 99.9<br>purity 99.8                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.01;  \delta P/bar = \pm 0.4;$<br>$\delta x_{He} = \delta y_{He} = \pm 0.0002.$ |                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             | REFERE                                                                                                                 | NCES :                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Helium; He; 7440-59-7 (1)Oxygen; 0,; 7782-44-7 Kriog. Mashinostr., <u>1971</u>, 13, 90. (2) Mole fraction of helium Mole fraction of helium in vapor, T/K T/K P/bar in liquid, P/bar in liquid, in vapor,  $x_{\rm He}$  $x_{\rm He}$  $y_{\rm He}$ <sup>y</sup>He 98.1 90.58 0.0080 0.9765 166.7 0.0262 0.9540 103.06 107.9 0.0087 0.9780 176.5 0.0275 0.9555 117.7 0.0095 0.9800 186.3 0.0289 0.9565 127.5 0.9810 196.1 0.9570 0.0103 0.0301 137.3 0.0111 0.9810 205.9 0.0313 0.9570 147.1 0.0119 0.9820 215.7 0.0323 0.9575 116.22 156.9 0.0127 0.9830 9.8 0.0005 19.6 166.7 0.0135 0.9830 0.0036 176.5 0.0143 0.9835 29.4 0.0067 0.5650 186.3 0.0150 0.9835 39.2 0.0097 0.6700 196.1 0.9835 0.0155 49.0 0.0128 0.7290 205.9 0.0165 0.9835 58.8 0.0158 0.7680 0.0172 215.7 0.9830 68.6 0.0188 0.7940 103.06 9.8 0.0012 -78.5 0.0216 0.8130 19.6 0.0030 88.3 0.0243 0.8280 29.4 0.0049 0.8300 98.1 0.0268 0.8410 39.2 0.0066 0.8640 107.9 0.0294 0.8520 49.0 0.0083 0.8905 117.7 0.0320 0.8610 58.8 0.0100 0.9060 127.5 0.0344 0.8690 0.9115 0.8760 68.6 0.0118 137.3 0.0370 78.5 0.0133 0.9230 147.1 0.0394 0.8815 88.3 0.0149 0.9295 156.9 0.0419 0.8865 98.1 0.0165 0.9350 166.7 0.0443 0.8910 107.9 0.0180 0.9390 176.5 0.0467 0.8950 117.7 0.0195 0.9430 186.3 0.0490 0.8985 127.5 0.0208 0.9460 196.1 0.0513 0.9020 137.3 205.9 0.0536 0.0221 0.9485 0.9055 147.1 0.0234 0.9510 215.7 0.0560 0.9085 0.0248 0.9520 156.9

| COMPONENTS ·                                                              | ORTGINAL MEASUREMENTS:                                         |  |  |  |  |  |
|---------------------------------------------------------------------------|----------------------------------------------------------------|--|--|--|--|--|
| oom onenig.                                                               | URIGINAL MEASUREMENTS:                                         |  |  |  |  |  |
| (1) Helium; He; 7440-59-7                                                 | Sinor, J. E. and Kurata, F.,                                   |  |  |  |  |  |
| (2) Oxygen; 0,; 7782-44-7                                                 | J. Chem. Engng. Data, <u>1966</u> , 11, 537.                   |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
| VARIABLES:                                                                | PREPARED BY:                                                   |  |  |  |  |  |
| Temperature, pressure                                                     | C. L. Young                                                    |  |  |  |  |  |
| -                                                                         |                                                                |  |  |  |  |  |
| EXPERIMENTAL VALUES:                                                      |                                                                |  |  |  |  |  |
| Mole fraction of belium                                                   | Mole fraction of holium                                        |  |  |  |  |  |
| T/K P/bar in liquid, $x_{He}$                                             | T/K P/bar in liquid, $x_{H_{A}}$                               |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
| 77.35 17.2 0.0004                                                         | 113.15 68.95 0.0154<br>86.18 0.0195                            |  |  |  |  |  |
| 51.7 0.0020                                                               | 103.4 0.0232                                                   |  |  |  |  |  |
| 68.95 0.0025<br>86.18 0.0032                                              | 120.7 0.0267<br>137.9 0.0302                                   |  |  |  |  |  |
| 103.4 0.0036                                                              | 128.15 34.5 0.0086                                             |  |  |  |  |  |
| 120.7 0.0043<br>137.9 0.0048                                              | 51.7 0.0159<br>68.95 0.0237                                    |  |  |  |  |  |
| 93.15 17.2 0.0014                                                         | 86.18 0.0314                                                   |  |  |  |  |  |
| 51.7 0.0053                                                               | 103.4 0.0384<br>120.7 0.0446                                   |  |  |  |  |  |
| 68.95 0.0068<br>86.18 0.0083                                              | 137.9 0.0508                                                   |  |  |  |  |  |
| 103.4 0.0099                                                              | 68.95 0.0330                                                   |  |  |  |  |  |
| 120.7 0.0114<br>137.9 0.0127                                              | 86.18 0.0461<br>103.4 0.0599                                   |  |  |  |  |  |
| 113.15 17.2 0.0027                                                        | 120.7 0.0725                                                   |  |  |  |  |  |
| 34.5 0.0074<br>51.7 0.0113                                                | 137.9 0.0860                                                   |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
| AUXILIARY                                                                 | INFORMATION                                                    |  |  |  |  |  |
| METHOD/APPARATUS/PROCEDURE:                                               | SOURCE AND PURITY OF MATERIALS:                                |  |  |  |  |  |
| Static equilibrium cell (0.1 & capa-                                      | 1. U.S. Bureau of Mines sample, maxi-                          |  |  |  |  |  |
| City) fitted with magnetic stirrer.<br>Temperature measured with platinum | mum impurity 12 parts per million.                             |  |  |  |  |  |
| resistance thermometer. Pressure                                          | 2. Linde Co. sample purity 99.7 mole per cent.                 |  |  |  |  |  |
| Components charged into cell,                                             |                                                                |  |  |  |  |  |
| equilibrated liquid samples withdrawn                                     |                                                                |  |  |  |  |  |
| source and ref. 1.                                                        |                                                                |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
|                                                                           | ESTIMATED ERROR:                                               |  |  |  |  |  |
|                                                                           | $\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.1;$              |  |  |  |  |  |
|                                                                           | $\delta x_{\text{He}} = \pm 1$ % or $\pm 0.0003$ (whichever is |  |  |  |  |  |
|                                                                           | REFERENCES:                                                    |  |  |  |  |  |
|                                                                           | Sinor, J. F. Schindler, D. J. and                              |  |  |  |  |  |
|                                                                           | Kurata, F., Am. Inst. Chom. Engange                            |  |  |  |  |  |
|                                                                           | J., 1966, 12. 353.                                             |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |
|                                                                           |                                                                |  |  |  |  |  |

|                     |                |                     | · · · · · · · · · · · · · · · · · · ·                                   |                                 |  |  |  |
|---------------------|----------------|---------------------|-------------------------------------------------------------------------|---------------------------------|--|--|--|
| COMPONENT           | S:             |                     | ORIGINAL MEASUREMENTS:                                                  |                                 |  |  |  |
| (1) H               | Ielium; He;    | 7440-59-7           | Skripka, V. G. and D<br>Trudy Vses. NauchI                              | ykhno, N. M.,<br>ssled. Inst.   |  |  |  |
| (2)                 | лууеп, 02,     | //02-44-/           |                                                                         | <i>r., <u>1904</u>, 8, 103.</i> |  |  |  |
| VARIABLES           | S:             |                     | PREPARED BY:                                                            |                                 |  |  |  |
| Tempera             | ture, press    | ure                 | C. L. Young                                                             |                                 |  |  |  |
| EXPERIMEN           | NTAL VALUES:   |                     |                                                                         | C. h. J. i.u.                   |  |  |  |
| т/к                 | P/bar          | P <sup>+</sup> /bar | in liquid, x <sub>He</sub> i                                            | n vapor, y <sub>He</sub>        |  |  |  |
| 67.5                | 6.02           | 5.98                | 0.000126                                                                | 0.9956                          |  |  |  |
|                     | 11.16          | 11.12               | 0.000228                                                                | 0.9973                          |  |  |  |
|                     | 16.14<br>21.30 | 16.10<br>21 26      | 0.000336                                                                | 0.9974<br>0.9979                |  |  |  |
|                     | 26.30          | 26.26               | 0.000541                                                                | 0.9983                          |  |  |  |
| 72.0                | 6.01           | 5.92                | 0.000178                                                                | 0.9828                          |  |  |  |
|                     | 11.26          | 11.17               | 0.000321                                                                | 0.9904                          |  |  |  |
|                     | 16.22          | 16.13               | 0.000472                                                                | 0.9929                          |  |  |  |
|                     | 21.29          | 21.20               | 0.000619                                                                | 0.9943                          |  |  |  |
| 78.0                | 6.06           | 5.83                | 0.000240                                                                | 0.9539                          |  |  |  |
|                     | 11.04          | 10.81               | 0.000427                                                                | 0.9732                          |  |  |  |
|                     | 16.20          | 15.97               | 0.000622                                                                | 0.9819                          |  |  |  |
|                     | 21.22          | 20.98               | 0.000822                                                                | 0.9858                          |  |  |  |
| 84 0                | 26.26          | 26.03               | 0.000998                                                                | 0.9881                          |  |  |  |
| 04.0                | 11.05          | 10.53               | 0.000660                                                                | 0.9418                          |  |  |  |
|                     | 16.02          | 15.49               | 0.000947                                                                | 0.9606                          |  |  |  |
|                     | 21.19          | 20.66               | 0.001267                                                                | 0.9687                          |  |  |  |
| 00.2                | 26.30          | 25.78               | 0.001592                                                                | 0.9737                          |  |  |  |
| 90.3                | 11 05          | 999                 | 0.000448                                                                | 0.8804                          |  |  |  |
|                     | 16.13          | 15.07               | 0.001338                                                                | 0.9178                          |  |  |  |
|                     | 21.14          | 20.07               | 0.001791                                                                | 0.9352                          |  |  |  |
|                     | 26.24          | 25.18               | 0.002249                                                                | 0.9472                          |  |  |  |
| P <sup>+</sup> part | ial pressure   | e of helium         |                                                                         |                                 |  |  |  |
|                     |                | AUXILIARY           | INFORMATION                                                             |                                 |  |  |  |
| METHOD /            | APPARATUS/PI   | ROCEDURE:           | SOURCE AND PURITY OF MAT                                                | EKIALS:                         |  |  |  |
| Vapor f             | low apparati   | is with magnetic    | 1. High purity cont                                                     | aining no more                  |  |  |  |
| recircu             | Lating pump.   | Temperature         | than 0.008% hydro                                                       | ogen, 0.02%                     |  |  |  |
| thermom             | eter pressur   | e measured with     | hydrocarbons                                                            |                                 |  |  |  |
| Bourdon             | gauge. Sa      | amples of gas and   | 2. Purity 99.5 mole per cent or                                         |                                 |  |  |  |
| liquid              | analysed by    | gas phase inter-    | better major imp                                                        | urities argon and               |  |  |  |
| feromet             | ry. Detail     | s in source.        | water vapor.                                                            |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     | ESTIMATED ERROR:                                                        |                                 |  |  |  |
|                     |                |                     | $\delta T/K = \pm 0.02$ to 0.03                                         | ; $\delta P$ less than          |  |  |  |
|                     |                |                     | 0.2 bar; $\delta x_{\text{He}} \simeq \delta y_{\text{He}}$<br>0.00002. | =±0.00001 to                    |  |  |  |
|                     |                |                     | REFERENCES:                                                             |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |
|                     |                |                     |                                                                         |                                 |  |  |  |

| COMPONENTS:                                                            |                        | ORIGINAL M                         | EASUREMEN           | TS:                        |
|------------------------------------------------------------------------|------------------------|------------------------------------|---------------------|----------------------------|
| (1) Helium; He; 7440-59                                                | 9-7                    | De Swaan                           | Arons,              | J. and Diepen, G.A.M.,     |
| (2) Xenon; Xe; 7440-63                                                 | 3-3                    | J. Chem.                           | Phys.,              | <u>1966, 44,</u> 2322.     |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
| VARIABLES:                                                             |                        | PREPARED B                         | Υ:                  |                            |
| Temperature, pressure                                                  |                        | C. L. Yo                           | ung                 |                            |
|                                                                        |                        |                                    |                     |                            |
| EXPERIMENTAL VALUES:                                                   |                        |                                    |                     |                            |
| Mol                                                                    | e fraction<br>f helium | ית <sup>+</sup> ∕א                 | P <sup>+</sup> /bar | Mole fraction              |
|                                                                        | 0401                   | - /                                | - , 202             | 0 1505                     |
| 278.30 51.7 0<br>283.00 58.4 0                                         | .0491                  | 287.95                             | 90.3<br>98.9        | 0.1535<br>0.1535           |
| 285.35 62.2 0                                                          | .0491                  | 290.60                             | 109.2               | 0.1535                     |
| 288.05 68.3 0                                                          | .0491                  | 291.40                             | 127.7               | 0.1535                     |
| $\begin{bmatrix} 289.30 & 73.7 & 0 \\ 200.40 & 76.7 & 0 \end{bmatrix}$ | .0491                  | 291.55                             | 133.7               | 0.1535                     |
|                                                                        | 0491                   | 291.65                             | 157 1               | 0.1535                     |
| 281.75 103.7 0                                                         | .0491                  | 290.25                             | 205.1               | 0.1535                     |
| 278.45 108.6 0                                                         | .0491                  | 286.40                             | 263.7               | 0.1535                     |
| 278.90 59.9 0                                                          | .1054                  | 281.75                             | 325.2               | 0.1535                     |
| 282.50 66.5 0                                                          | .1054                  | 282.65                             | 91.3                | 0.2385                     |
| 285.45 $/3.4$ 0                                                        | .1054                  | 285.40                             | 101.6               | 0.2385                     |
| 287.65 80.4 0                                                          | .1054                  | 288.55                             | 118.2               | 0.2385                     |
| 289.65 92.7 0                                                          | .1054                  | 290.75                             | 137.9               | 0.2385                     |
| 290.00 102.7 0                                                         | .1054                  | 292.15                             | 163.5               | 0.2385                     |
| 1290.05 $104.2$ 0                                                      | .1054                  | 292.80                             | 187.3               | 0.2385                     |
| 289.85 127.7 0                                                         | .1054                  | 292.85                             | 189.6               | 0.2385                     |
| 287.65 150.5 0                                                         | .1054                  | 294.00                             | 253.2               | 0.2385                     |
| 284.05 175.4 0                                                         | .1054                  | 293.40                             | 354.5               | 0.2385                     |
| 281.25 192.8 0                                                         | .1054                  | 290.85                             | 506.6               | 0.2385                     |
| 278.45 209.8 0                                                         | .1054                  | 287.75                             | 724.4               | 0.2385                     |
| 285.35 81.0 0                                                          | .1535                  | 284.10                             | 1433.5              | 0.2385                     |
|                                                                        |                        |                                    |                     | (cont.)                    |
|                                                                        |                        | TNEODMATTO                         | N                   | (550007)                   |
|                                                                        | AUXILIANI              |                                    |                     |                            |
| METHOD / APPARATUS / PROCEDURI                                         | E:                     | SOURCE AND                         | PURITY O            | F MATERIALS:               |
| Sample confined in glass v                                             | vessel en-             | (1) Ohio                           | Chemica             | 1 and Surgical             |
| by electromagnetic stirrer                                             | r. Pressure            | per o                              | cent.               | • puricy 99.99 more        |
| measured on pressure balar                                             | nce. Details           | (2) Hood                           |                     |                            |
| in source and ref. 1.                                                  |                        | (2) HOECI                          | ISL AG S            | ampre.                     |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        | FOTTMATED                          | FDDOD.              |                            |
|                                                                        |                        | $\delta m / v = + 0$               | LRROR:              | $P(h_{2}, r_{-}, +0, 0.1)$ |
|                                                                        |                        | OTK = 10                           | .05; 0              | F/Dar = 10.016;            |
|                                                                        |                        | δ <sup>x</sup> He <sup>(maxi</sup> | .mum) =             | ±18.                       |
|                                                                        |                        | REFERENCES                         | 3:                  |                            |
|                                                                        |                        | l. van He                          | est, J.A            | .M. and Diepen,            |
|                                                                        |                        | G.A.M.                             | , Symp.             | Phys. Chem., High          |
|                                                                        |                        | Pressu                             | re, Lon             | don, 1962, <u>1962</u> .   |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |
|                                                                        |                        |                                    |                     |                            |

|                   |                     |                            | a principal de la construction d |                    |                              |
|-------------------|---------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------|
| COMPON            | ENTS:               |                            | ORIGINAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | MEASURE            | CMENTS:                      |
| (1) H             | elium; He;          | 7440-59-7                  | De Swaan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Arons,             | J. and Diepen, G.A.M.,       |
| (2) X             | enon; Xe;           | 7440-63-3                  | J. Chem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Phys,,             | <u>1966</u> , 44, 2322.      |
| (_,               |                     |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                              |
| ]                 |                     |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                              |
| EXPERIM           | 1ENTAL VALU         | JES :                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                              |
| T <sup>+</sup> /K | P <sup>+</sup> /bar | Mole fraction<br>of helium | т <sup>+</sup> /к                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | P <sup>+</sup> /ba | Mole fraction<br>r of helium |
| 278.25            | 83.3                | 0.2544                     | 299.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 465.4              | 0.5053                       |
| 282.10            | 95.1                | 0.2544                     | 302.05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 574.3              | 0.5053                       |
| 285.70            | 110.3               | 0.2544                     | 303.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 617.0              | 0.5053                       |
| 289.25            | 134.2               | 0.2544                     | 305 45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 705 9              | 0 5053                       |
| 289 40            | 135 8               | 0 2544                     | 310 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 910 1              | 0 5053                       |
| 200.90            | 153.3               | 0 2544                     | 315 00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1160 2             | 0.5053                       |
| 290.00            | 101 4               | 0.2544                     | 313.90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1200.2             | 0.5055                       |
| 292.20            | 191.4               | 0.2544                     | 320.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1390.7             | 0.5053                       |
| 292.35            | 196./               | 0.2544                     | 325.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1651.4             | 0.5053                       |
| 292.40            | 199.8               | 0.2544                     | 331.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1965.8             | 0.5053                       |
| 292.45            | 200.6               | 0.2544                     | 278.35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 181.7              | 0.5587                       |
| 292.55            | 205.1               | 0.2544                     | 283.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 221.8              | 0.5587                       |
| 293.80            | 285.8               | 0.2544                     | 288.45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 276.3              | 0.5587                       |
| 293.80            | 314.7               | 0.2544                     | 293.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 351.5              | 0.5587                       |
| 293.45            | 373.6               | 0.2544                     | 298.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 469.8              | 0.5587                       |
| 292.85            | 432.4               | 0.2544                     | 303.35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 637.6              | 0.5587                       |
| 291.00            | 573.6               | 0.2544                     | 306.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 743.5              | 0.5587                       |
| 289.60            | 705.1               | 0.2544                     | 306.45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 762.7              | 0.5587                       |
| 287.95            | 973.8               | 0.2544                     | 307.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 808.9              | 0.5587                       |
| 288.50            | 1612.2              | 0.2544                     | 315.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1133.1             | 0.5587                       |
| 278.30            | 93.8                | 0.3036                     | 322.55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1426.9             | 0.5587                       |
| 282.70            | 110.0               | 0.3036                     | 329.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1741.2             | 0.5587                       |
| 287.95            | 140.0               | 0.3036                     | 333.75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1965.8             | 0.5587                       |
| 290.85            | 171.0               | 0.3036                     | 278.45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 207.6              | 0.6028                       |
| 293.00            | 223.8               | 0.3036                     | 283.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 254.2              | 0.6028                       |
| 293.20            | 229.7               | 0.3036                     | 287.55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 296.0              | 0.6028                       |
| 293.25            | 231.8               | 0.3036                     | 293.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 394.3              | 0.6028                       |
| 293.40            | 237.7               | 0.3036                     | 298.90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 516.1              | 0.6028                       |
| 293.50            | 241.5               | 0.3036                     | 305.15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 713.3              | 0.6028                       |
| 293.50            | 242.5               | 0.3036                     | 311.15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 942.4              | 0.6028                       |
| 293.95            | 260.1               | 0.3036                     | 313.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1046.6             | 0.6028                       |
| 295.20            | 317.0               | 0.3036                     | 317.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1189.5             | 0.6028                       |
| 295.25            | 320.2               | 0.3036                     | 324.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1504.8             | 0.6028                       |
| 296.70            | 491.2               | 0.3036                     | 331.15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1786.2             | 0.6028                       |
| 296.80            | 762.7               | 0.3036                     | 336.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2046.8             | 0.6028                       |
| 297.70            | 1126.9              | 0.3036                     | 283.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 289.4              | 0.6518                       |
| 281.60            | 114.7               | 0.3537                     | 290.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 395.0              | 0.6518                       |
| 286.30            | 139.1               | 0.3537                     | 297.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 532.2              | 0.6518                       |
| 291.15            | 185.9               | 0.3537                     | 303.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 676.9              | 0.6518                       |
| 292.05            | 198.1               | 0.3537                     | 308.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 862.1              | 0.6518                       |
| 294.00            | 242.9               | 0.3537                     | 315.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1105.6             | 0.6518                       |
| 295.70            | 302.3               | 0.3537                     | 321.15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1349.5             | 0.6518                       |
| 299.15            | 455.9               | 0.3537                     | 321.15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1350.6             | 0.6518                       |
| 302.75            | /62./               | 0.3537                     | 323.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1462.9             | 0.6518                       |
| 305.95            | 1126.9              | 0.3537                     | 330.75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1/59.2             | 0.6518                       |
| 309.78            | 1561.5              | 0.3537                     | 336.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2015.3             | 0.6518                       |
| 280.00            | 126.8               | 0.4053                     | 278.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 265.8              | 0.6786                       |
| 282.80            | 142.0               | 0.4053                     | 284.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 331.2              | 0.6786                       |
| 288.10            | 181.6               | 0.4053                     | 287.90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 381.8              | 0.6786                       |
| 293.30            | 259.6               | 0.4053                     | 292.55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 460.1              | 0.6786                       |
| 296.90            | 380./               | 0.4053                     | 298.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 586.3              | 0.6786                       |
| 297.15            | 390.5               | 0.4053                     | 303.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | /11.3              | 0.6786                       |
| 300.85            | 550.0               | 0.4053                     | 309.05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 897.0              | 0.6786                       |
| 304.25            | /39.4               | 0.4053                     | 315.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1145.4             | 0.6786                       |
| 309.15            | T0.28.0             | 0.4053                     | 321.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1379.0             | 0.6786                       |
| 313.75            | 1427.9              | 0.4053                     | 328.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1664.0             | 0.6786                       |
| 317.80            | 1/41.3              | 0.4053                     | 332.05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1820.4             | 0.6786                       |
| 2/9.55            | 163.2               | 0.5053                     | 338.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2109.5             | 0.6786                       |
| 283.75            | 192.8               | 0.5053                     | 278.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 290.1              | 0.7016                       |
| 289.35            | 249.6               | 0.5053                     | 283.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 348.2              | 0.7016                       |
| 294.85            | 343.5               | 0.5053                     | 289.55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 437.5              | 0.7016                       |
|                   |                     |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                              |

•

| COMPONE                                                                                                                                                                                                        | NTS:                                                                                                                                                                                              |                                                                                                                                                                                                                    | ORIGINAL MEASUREMENTS:                                                                                                                                                                     |                                                                                                                                                                                                                                             |                                                                                                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| (1) He                                                                                                                                                                                                         | lium; He;                                                                                                                                                                                         | 7440-59-7                                                                                                                                                                                                          | De Swaan                                                                                                                                                                                   | Arons,                                                                                                                                                                                                                                      | J. and Diepen, G.A.M.,                                                                                                                                                                               |  |
| (2) Xe                                                                                                                                                                                                         | non; Xe;                                                                                                                                                                                          | 7440-63-3                                                                                                                                                                                                          | J. Chem.                                                                                                                                                                                   | Pnys.,                                                                                                                                                                                                                                      | 1966, 44, 2322.                                                                                                                                                                                      |  |
|                                                                                                                                                                                                                |                                                                                                                                                                                                   |                                                                                                                                                                                                                    |                                                                                                                                                                                            |                                                                                                                                                                                                                                             |                                                                                                                                                                                                      |  |
| J                                                                                                                                                                                                              |                                                                                                                                                                                                   |                                                                                                                                                                                                                    |                                                                                                                                                                                            |                                                                                                                                                                                                                                             |                                                                                                                                                                                                      |  |
| EXPERIM                                                                                                                                                                                                        | ENTAL VALU                                                                                                                                                                                        | JES:                                                                                                                                                                                                               |                                                                                                                                                                                            |                                                                                                                                                                                                                                             |                                                                                                                                                                                                      |  |
| K                                                                                                                                                                                                              | P <sup>+</sup> /bar                                                                                                                                                                               | Mole fraction<br>of helium                                                                                                                                                                                         | т <sup>+</sup> /к                                                                                                                                                                          | P <sup>+</sup> /bar                                                                                                                                                                                                                         | Mole fraction<br>of helium                                                                                                                                                                           |  |
| 295.85<br>302.05<br>311.10<br>318.35<br>324.95<br>333.90<br>277.85<br>284.65<br>291.10<br>295.85<br>301.35<br>307.30<br>314.00<br>319.70<br>324.85<br>330.00<br>335.35<br>282.05<br>287.30<br>293.20<br>298.65 | 557.6<br>710.2<br>991.2<br>1254.0<br>1519.6<br>1903.0<br>348.7<br>439.6<br>548.5<br>644.2<br>774.2<br>939.0<br>1146.0<br>1344.7<br>1538.5<br>1741.2<br>1965.8<br>551.6<br>647.6<br>770.5<br>912.0 | $\begin{array}{c} 0.7016\\ 0.7016\\ 0.7016\\ 0.7016\\ 0.7016\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.7534\\ 0.8270\\ 0.8270\\ 0.8270\\ 0.8270\\ 0.8270\\ \end{array}$ | 303.20<br>310.75<br>316.10<br>322.70<br>328.85<br>334.55<br>278.55<br>283.20<br>288.80<br>295.25<br>308.95<br>314.80<br>322.50<br>285.75<br>288.85<br>292.80<br>297.80<br>303.05<br>308.95 | 10 31 . 4<br>1250 . 4<br>14 20 . 2<br>1651 . 4<br>1875 . 0<br>2100 . 5<br>717 . 5<br>816 . 5<br>942 . 7<br>1104 . 9<br>1310 . 4<br>1509 . 1<br>1701 . 8<br>1974 . 8<br>1314 . 1<br>1400 . 0<br>1519 . 6<br>1669 . 4<br>1849 . 6<br>2074 . 0 | 0.8270<br>0.8270<br>0.8270<br>0.8270<br>0.8270<br>0.8270<br>0.8270<br>0.8783<br>0.8783<br>0.8783<br>0.8783<br>0.8783<br>0.8783<br>0.8783<br>0.9275<br>0.9275<br>0.9275<br>0.9275<br>0.9275<br>0.9275 |  |
|                                                                                                                                                                                                                |                                                                                                                                                                                                   |                                                                                                                                                                                                                    |                                                                                                                                                                                            |                                                                                                                                                                                                                                             |                                                                                                                                                                                                      |  |

| COMPONENTS:                                                                                       | ORIGINAL MEASUREMENTS:                                                                                            |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|                                                                                                   |                                                                                                                   |
| (1) Helium; He; 7440-59-7                                                                         | Grove, N. H., and Whitby, F. P.,                                                                                  |
| (2) Santowax R:                                                                                   | <i>b</i> , <i>Appe</i> , <i>chem</i> , <u>1900</u> , 10, 101.                                                     |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
| VARIABLES:                                                                                        | PREPARED BY:                                                                                                      |
| Temperature, pressure                                                                             | C. L. Young                                                                                                       |
|                                                                                                   |                                                                                                                   |
| EXPERIMENTAL VALUES:                                                                              |                                                                                                                   |
| T/K P/bar Solubility * Ostwald coeffici                                                           | ent                                                                                                               |
| 506 1.81 5.3 0.114                                                                                |                                                                                                                   |
| 511         2.58         6.3         0.097           511         4.04         9.0         0.089   |                                                                                                                   |
| 511         4.04         9.0         0.089           598         2.13         9.3         0.189   |                                                                                                                   |
| 599         3.04         11.0         0.157           600         4.76         16.0         0.146 |                                                                                                                   |
| 674 2.43 12.7 0.236                                                                               |                                                                                                                   |
| 679         3.48         16.3         0.212           679         5.41         24.2         0.202 |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
| *                                                                                                 |                                                                                                                   |
| Moles of nellum per mg of Santo                                                                   | wax k                                                                                                             |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
|                                                                                                   | ······································                                                                            |
| AUXILIARY                                                                                         | INFORMATION                                                                                                       |
| METHOD /APPARATUS/PROCEDURE:                                                                      | SOURCE AND PURITY OF MATERIALS:                                                                                   |
| Static cell with null pressure trans-<br>ducer. Pressure measured with                            | 1. No details given.                                                                                              |
| Bourdon gauge. Temperature measured                                                               | 2. Analysis by infrared method showed                                                                             |
| with thermocouple. Sample placed in cell and gas added at room tempera-                           | 56.3% m-terphenyl, 29.3% p-ter-                                                                                   |
| ture. Cell then heated to experi-                                                                 | phenyl, 2.6% diphenyl and higher                                                                                  |
| mental temperature. Pressures on                                                                  | Monsanto Chemicals Ltd.                                                                                           |
| approximately equal. Details in                                                                   |                                                                                                                   |
| source.                                                                                           |                                                                                                                   |
|                                                                                                   |                                                                                                                   |
| ī                                                                                                 |                                                                                                                   |
|                                                                                                   | ESTIMATED ERROR:                                                                                                  |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$                                               |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.                |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.                |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.<br>REFERENCES: |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.<br>REFERENCES: |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.<br>REFERENCES: |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.<br>REFERENCES: |
|                                                                                                   | ESTIMATED ERROR:<br>$\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$<br>$\delta x_{He} = \pm 10$ %.<br>REFERENCES: |

| COMPONEN                               | т <b>С •</b> |                                |                     | OPTGINAL MEASUREMENTS .         |                                               |                        |                      |  |  |
|----------------------------------------|--------------|--------------------------------|---------------------|---------------------------------|-----------------------------------------------|------------------------|----------------------|--|--|
| CONFORMIS:                             |              |                                |                     | ORIGINAL MEASUREMENTS:          |                                               |                        |                      |  |  |
| (1) Neon; Ne; 7440-01-9                |              |                                |                     | Stree                           | tt, W. B                                      | . and Hill,            | J. L. E.,            |  |  |
| (2) Methane; CH <sub>4</sub> ; 74-82-8 |              |                                |                     | Progr                           | . Refrig                                      | . Sci. Techn           | ol. XIII             |  |  |
|                                        |              |                                |                     | Proc.                           | Interna                                       | t. Congr. Re           | frig., <u>1971</u> , |  |  |
|                                        |              |                                |                     | 1, 30                           | 9.                                            |                        |                      |  |  |
|                                        | _            |                                |                     |                                 |                                               |                        |                      |  |  |
| VARIABLE                               | S :          |                                |                     | PREPAREI                        | D BY:                                         |                        |                      |  |  |
| Tempera                                | ture, p      | ressure                        |                     | C. L                            | . Young                                       |                        |                      |  |  |
|                                        |              |                                |                     |                                 |                                               |                        |                      |  |  |
| EXPERIME                               | NTAL VALI    | JES:                           | -                   |                                 |                                               |                        | c                    |  |  |
| T/K                                    | P/bar        | in liquid,                     | in vapor,           | т/к                             | <i>P/</i> bar                                 | in liquid,             | in vapor,            |  |  |
|                                        | •            | <sup>x</sup> Ne                | <sup>y</sup> Ne     |                                 | •                                             | <sup>x</sup> Ne        | <sup>y</sup> Ne      |  |  |
| 05.26                                  |              | 0.0050                         |                     |                                 | 244 E                                         | 0.0705                 | 0.0004               |  |  |
| 95.20                                  | 20.3<br>34.5 | 0.0059                         | -                   | 112.27                          | 344.5<br>551.2                                | 0.0795                 | 0.9684               |  |  |
|                                        | 47.6         | 0.0111                         | 0.9902              |                                 | 689.0                                         | 0.1014                 | 0.9690               |  |  |
|                                        | 68.9         | 0.0165                         | 0.9914              |                                 | 826.8                                         | 0.1027                 | 0.9706               |  |  |
|                                        | 137.8        | 0.0275                         | -                   |                                 | 1102.4                                        | 0.0993                 | 0.9738               |  |  |
|                                        | 175.3        | 0.0310                         | 0.9889              |                                 | 1240.2                                        | 0.0980                 | 0.9744               |  |  |
|                                        | 206.7        | 0.0354                         | 0.9890              | 117 40                          | 1324.3                                        | 0.097                  | 0.975                |  |  |
|                                        | 344.5        | 0.0410                         | 0.988               | 11/.49                          | 551.2                                         | 0.1087                 | 0.9592               |  |  |
| 102.91                                 | 34.5         | 0.0107                         | 0.9710              |                                 | 689.0                                         | 0.1125                 | 0.9589               |  |  |
|                                        | 68.9         | 0.0196                         | 0.9817              |                                 | 826.8                                         | 0.1215                 | 0.9604               |  |  |
|                                        | 137.8        | 0.0342                         | 0.9808              |                                 | 1102.4                                        | 0.1202                 | 0.9640               |  |  |
|                                        | 206.7        | 0.0423                         | -                   |                                 | 1240.2                                        | 0.1189                 | 0.9662               |  |  |
|                                        | 275.6        | 0.0528                         | 0.9820              |                                 | 1378.0                                        | 0.1178                 | 0.9684               |  |  |
|                                        | 551.2        | 0.0617                         | 0.9804              |                                 | 1653.6                                        | 0.1137                 | 0.9701<br>0.9739     |  |  |
|                                        | 689.0        | 0.0695                         | 0.9796              |                                 | 1730.6                                        | 0.109                  | 0.976                |  |  |
| 112 27                                 | 771.1        | 0.071                          | 0.979               | 126.61                          | 413.4                                         | 0.1337                 | 0.9357               |  |  |
| 112.27                                 | 68.9         | 0.0127                         | 0.9681              |                                 | 689.0                                         | 0.1606                 | 0.9350               |  |  |
|                                        | 137.8        | 0.0434                         | 0.9728              |                                 | 826.8                                         | 0.1641                 | 0.9401               |  |  |
|                                        | 172.3        | 0.0509                         | 0.9732              |                                 | 964.6                                         | 0.1679                 | 0.9425               |  |  |
|                                        | 200.7        | 0.0571                         | 0.9720              |                                 | 1240.2                                        | 0.1058                 | 0.9490               |  |  |
|                                        |              |                                | AUXILIARY           | INFORMAT                        | ION                                           |                        |                      |  |  |
| METHOD /                               | APPARAT      | US/PROCEDURE:                  |                     | SOURCE AND PURITY OF MATERIALS: |                                               |                        |                      |  |  |
| Recircu                                | lating v     | vapor flow ap                  | paratus with        | No details given.               |                                               |                        |                      |  |  |
| magneti                                | c pump a     | at ambient te                  | mperature.          |                                 |                                               |                        |                      |  |  |
| Samples<br>tivity                      | analyse      | ed by thermal<br>erature measu | conduc-<br>red with |                                 |                                               |                        |                      |  |  |
| platinu                                | n resist     | tance thermom                  | eter.               |                                 |                                               |                        |                      |  |  |
| Pressure                               | e measu      | ed with Bour                   | don gauge.          |                                 |                                               |                        |                      |  |  |
| Details                                | in ref.      | . 1.                           |                     |                                 |                                               |                        |                      |  |  |
|                                        |              |                                |                     |                                 |                                               |                        |                      |  |  |
|                                        |              |                                |                     |                                 |                                               |                        |                      |  |  |
|                                        |              |                                |                     |                                 |                                               |                        |                      |  |  |
|                                        |              |                                |                     | FOTTMAT                         | T EDDOD.                                      |                        |                      |  |  |
|                                        |              |                                |                     | $\delta T/K =$                  | $\pm 0.02$ :                                  | $\delta P/bar = \pm 1$ | 1.                   |  |  |
|                                        |              |                                |                     | 61/10<br>8m                     | ر <u>ــــــــــــــــــــــــــــــــــــ</u> | -0.001 (ostin          | -,                   |  |  |
|                                        |              |                                |                     | <sup>0</sup> "Ne'               | <sup>9</sup> Ne =                             | -u.uur (estin          | atea by              |  |  |
|                                        |              |                                |                     | DEFEDEN                         |                                               | comp                   | TTGL)                |  |  |
|                                        |              |                                |                     | ALFERENC                        |                                               |                        |                      |  |  |
|                                        |              |                                |                     | 1. Str                          | eett, W.                                      | B. and Jone            | es, C. H.,           |  |  |
|                                        |              |                                |                     | Adv                             | . Cryoge                                      | enic Engng.,           | 1965, 11,            |  |  |
|                                        |              |                                |                     | 355                             | •                                             |                        |                      |  |  |
|                                        |              |                                |                     |                                 |                                               |                        |                      |  |  |
|                                        |              |                                |                     |                                 |                                               |                        |                      |  |  |

COMPONENTS:ORIGINAL MEASUREMENTS:(1) Neon; Ne; 7440-01-9Streett, W. B. and Hill, J. L. E.,<br/>Progr. Refrig. Sci. Technol. XIII<br/>Proc. Internat. Congr. Refrig., 1971,<br/>1, 309.(2) Methane; CH4; 74-82-8Mole fraction of neon<br/>T/K P/bar in liquid, in vapor,<br/> $\frac{x_{Ne}}{y_{Ne}}$ Mole fraction of neon<br/>T/K P/bar in liquid, in vapor,<br/> $\frac{x_{Ne}}{y_{Ne}}$ 126.611515.80.15920.9557154.051653.60.41370.81881791.40.15200.96111791.40.39540.83812067.00.14250.96802067.00.35950.86822301.10.13290.97112411.50.32660.89312394.30.1290.9732757.10.29850.9117139.08344.50.17160.88733101.60.27100.9251413.40.19220.88483446.10.25280.9358551.20.22370.88434135.10.21990.9496689.00.24170.8842161.4983.10.06360.6389

| -,      | -,     | in inquia,      | in tupor, | -/     | . / 241 | III IIquiu,     | in vapor, |
|---------|--------|-----------------|-----------|--------|---------|-----------------|-----------|
|         |        | x <sub>NO</sub> | y No      |        |         | x <sub>NO</sub> | $y_{NO}$  |
| 1200 01 | 1515 0 | 0 1500          | 0.0557    | 154 05 | 1652 6  | NE              | Ne        |
| 120.01  | 1212.8 | 0.1592          | 0.9557    | 154.05 | 1023.0  | 0.413/          | 0.8188    |
|         | 1791.4 | 0.1520          | 0.9611    |        | 1791.4  | 0.3954          | 0.8381    |
|         | 2067.0 | 0.1425          | 0.9680    |        | 2067.0  | 0.3595          | 0.8682    |
| I       | 2301.1 | 0.1329          | 0.9711    |        | 2411.5  | 0.3266          | 0.8931    |
|         | 2394.3 | 0.129           | 0.973     |        | 2757.1  | 0.2985          | 0.9117    |
| 139 08  | 344 5  | 0 1716          | 0 8873    |        | 3101 6  | 0 2710          | 0 9251    |
| 1135.00 | 112 1  | 0 1022          | 0.00/0    |        | 2446 1  | 0.2710          | 0.0250    |
|         | 413.4  | 0.1922          | 0.0040    |        | 3446.1  | 0.2528          | 0.9358    |
| 1       | 551.2  | 0.2237          | 0.8843    |        | 4135.1  | 0.2199          | 0.9496    |
|         | 689.0  | 0.2417          | 0.8842    | 161.49 | 83.1    | 0.0636          | 0.6389    |
|         | 826.8  | 0.2508          | 0.8874    |        | 103.4   | 0.0845          | 0.6716    |
|         | 964.6  | 0.2535          | 0.8934    |        | 137.8   | 0.1170          | 0.7023    |
|         | 1102.4 | 0.2543          | 0.8996    |        | 172.3   | 0 1546          | 0 7107    |
|         | 1240 2 | 0 2507          | 0 0050    |        | 206 7   | 0 1900          | 0 7110    |
|         | 1270.2 | 0.2307          | 0.0100    |        | 200.7   | 0.1050          | 0.7110    |
|         | 1378.0 | 0.2403          | 0.9129    |        | 241.2   | 0.2276          | 0.7057    |
| 1       | 1053.0 | 0.2378          | 0.9226    |        | 275.6   | 0.2699          | 0.6905    |
|         | 2067.0 | 0.2137          | 0.9393    |        | 310.1   | 0.3139          | 0.6698    |
|         | 2411.5 | 0.1981          | 0.9486    |        | 344.5   | 0.3685          | 0.6356    |
|         | 2757.1 | 0.1848          | 0.9567    |        | 360.7   | 0.4100          | 0.5610    |
|         | 3100.5 | 0.1759          | 0.9615    |        | 371 9   | 0 515           | 0 515     |
|         | 3456 2 | 0 167           | 0 967     | 166 24 | 2536 2  | 0 655           | 0 655     |
| 110 00  | 412 4  | 0 2400          | 0.000     | 100.24 | 2550.2  | 0.000           | 0.000     |
| 140.00  | 413.4  | 0.2490          | 0.8230    |        | 2019.3  | 0.5377          | -<br>-    |
| 1       | 551.2  | 0.3051          | 0.8097    |        | 2660.8  | 0.5207          | 0.///4    |
|         | 703.2  | 0.3417          | 0.8037    |        | 2722.6  | 0.4918          | 0.7966    |
|         | 826.8  | 0.3606          | 0.8070    |        | 2853.3  | 0.4652          | 0.8183    |
| 1       | 964.6  | 0.3659          | 0.8163    |        | 2894.9  | 0.4507          | 0.8279    |
| 1       | 1102.4 | 0.3634          | 0.8285    |        | 3032.7  | 0.4236          | 0.8479    |
|         | 1240.2 | 0.3539          | 0 8426    |        | 3480 5  | 0 3655          | 0 8840    |
|         | 1515 8 | 0 3342          | 0 8653    |        | 3825 0  | 0 3326          | 0 0031    |
| 1       | 1701 / | 0 3173          | 0.0055    |        | 4125.0  | 0.3320          | 0 0160    |
|         | 1/91.4 | 0.3173          | 0.0009    | 167.16 | 4135.0  | 0.3144          | 0.9100    |
| 1       | 2067.0 | 0.2926          | 0.9030    | 10/.10 | 68.9    | 0.0534          | 0.5184    |
|         | 2411.5 | 0.2756          | 0.9187    |        | 103.4   | 0.0919          | 0.5931    |
|         | 2757.1 | 0.2462          | 0.9340    |        | 137.8   | 0.1344          | 0.6257    |
| 1       | 3156.3 | 0.2234          | 0.9437    |        | 172.3   | 0.1788          | 0.6505    |
|         | 3474.4 | 0.2083          | 0.9505    |        | 206.7   | 0.2198          | 0.6487    |
|         | 3790.6 | 0.1966          | 0.9502    |        | 234.1   | 0.2650          | 0.6250    |
| 1       | 4135.1 | 0.1840          | 0.9618    |        | 248 2   | 0 2959          | 0 6003    |
| 1       | 1272 9 | 0 179           | 0 964     |        | 261 4   | 0 3301          | 0 5700    |
| 152 05  | 412.0  | 0 2097          | 0 7672    |        | 201.4   | 0.3301          | 0.3700    |
| 152.95  | 413.4  | 0.3087          | 0.7073    | 1      | 274.5   | 0.455           | 0.455     |
|         | 551.2  | 0.3892          | 0./345    | 1/0.1/ | 2979.0  | 0.65/           | 0.65/     |
| 1       | 703.2  | 0.4835          | 0.6886    |        | 3067.1  | -               | 0.7766    |
|         | 826.8  | 0.5700          | 0.6593    |        | 3115.7  | 0.5133          | 0.7918    |
| 1       | 909.9  | 0.5316          | 0.6639    |        | 3170.5  | 0.4937          | 0.8064    |
|         | 964.6  | 0.5240          | 0.6858    |        | 3308.3  | 0.4563          | 0.8300    |
| 1       | 1033.5 | 0,5166          | 0.7057    |        | 3446.1  | 0.4317          | 0.8480    |
|         | 1102 4 | 0 4964          | 0 7266    |        | 3517 0  | 0 3001          | 0 8790    |
|         | 1378 0 | 0 4418          | 0 7005    |        | 4125 1  | 0.3501          | 0 0/00    |
|         | 1701.4 | 0.4410          | 0.7905    | 175 00 | 4133.1  | 0.3014          | 0.9499    |
|         | 1/91.4 | 0.3820          | 0.8486    | 1/5.00 | 34.5    | 0.00/2          | 0.1090    |
| 154.05  | 344.5  | 0.2685          | 0.7701    |        | 68.9    | 0.0550          | 0.3746    |
| 1       | 413.4  | 0.3142          | 0.7530    |        | 103.4   | 0.1050          | 0.4585    |
|         | 482.3  | 0.3649          | 0.7319    |        | 123.6   | 0.1445          | -         |
|         | 551.2  | 0.4181          | 0.7032    |        | 137.8   | 0.1660          | 0.4844    |
| 1       | 620.1  | 0.4718          | 0.6642    |        | 152.0   | 0 1981          | 0 4780    |
|         | 654 6  | 0 5055          | -         |        | 165 2   | 0 2320          | 0 4595    |
| i i     | 675 0  | 0 5000          | 0 582     |        | 172 2   | 0.2525          |           |
| l       | 1226 0 | 0.002           | 0.502     |        | 175 2   | 0.200           | 0 4 3 3 0 |
| 1       | 1220.0 | 0.020           | 0.030     |        | 1/5.3   | 0.2631          | 0.4319    |
| 1       | 1294.9 | -               | 0./404    |        | 184.4   | 0.360           | 0.360     |
| l I     | 1336.5 | -               | 0.7532    | 180.50 | 4076.3  | 0.664           | 0.664     |
|         | 1378.0 | 0.4818          | 0.7641    |        | 4162.4  | 0.5610          | 0.7688    |
| ł       | 1446.9 | 0.4606          | 0.7805    |        | 4231.3  | 0.5220          | 0.8034    |
| 154.05  | 1515.8 | 0.4430          | 0.7954    |        | 4356.0  | 0.4950          | 0.8290    |
|         |        |                 |           |        |         |                 |           |
| 1       |        |                 |           |        |         |                 |           |
| i       |        |                 |           |        |         |                 | 1         |

| COMPO | NENTS:               | EVALUATOR:                |  |  |
|-------|----------------------|---------------------------|--|--|
| 1.    | Neon; Ne; 7440-01-9  | Colin Young,              |  |  |
|       |                      | School of Chemistry,      |  |  |
| 2.    | Argon; Ar; 7440-37-1 | University of Melbourne,  |  |  |
|       |                      | Parkville, Victoria 3052, |  |  |
|       |                      | AUSTRALIA.                |  |  |

## CRITICAL EVALUATION:

This system has been studied by three groups of workers. The data of Streett and coworkers (1,2,3) are the most detailed and are in good agreement with the data of Trappeniers and Schouten (4) where the two sets of data overlap. The solubility values of Skripka and Dykhno (5) and Skripka and Lobonova (6) are somewhat higher than those obtained by Streett (1).

The data of Streett (1,2), Streett and Hill (3) and Trappeniers and Schouten (4) are classified as tentative whereas those of Skripka and Dykhno and Skripka and Lobonova are classified as doubtful.

## References

- 1. Streett, W. B., J. Chem. Phys., 1965, 42, 500.
- 2. Streett, W. B., J. Chem. Phys., 1967, 46, 3282.
- 3. Streett, W. B. and Hill, J. L. E., J. Chem. Phys., 1971, 54, 5088.
- 4. Trappeniers, N. J. and Schouten, J. A., Physics, 1974, 73, 539.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., 1964, no. 8, 163.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no. 13, 90.

| CONDONENTS .                                                         |                                                                                      |  |  |  |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------|--|--|--|
| COMPONENTS:                                                          | ORIGINAL MEASUREMENTS:                                                               |  |  |  |
| (1) Neon; Ne; 7440-01-9                                              | Skripka, V. G. and Dykhno, N. M.,                                                    |  |  |  |
| (2) Argon; Ar; 7440-37-1                                             | Kriog. Mashinstr., <u>1964</u> , 8, 163.                                             |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
| VARIABLES:                                                           | PREPARED BY:                                                                         |  |  |  |
| Temperature, pressure                                                |                                                                                      |  |  |  |
| iemperadure, pressure                                                | ·                                                                                    |  |  |  |
| EXPERIMENTAL VALUES:                                                 |                                                                                      |  |  |  |
| T/K $P/bar$ $P^+/bar$ Mole fraction                                  | tion of neon in liquid, in vapor,                                                    |  |  |  |
|                                                                      | x <sub>Ne</sub> y <sub>Ne</sub>                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
| 90.5 6.06 4.66<br>11.10 9.70                                         | 0.0044 0.7242<br>0.0092 0.8589                                                       |  |  |  |
| 16.15 14.75                                                          | 0.0138 0.8903                                                                        |  |  |  |
| 21.21 19.18<br>26.19 24.79                                           | 0.0185 0.9098<br>0.0231 0.9220                                                       |  |  |  |
| p <sup>+</sup> partial programs of noon                              |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
| AUXILIARY                                                            | INFORMATION                                                                          |  |  |  |
| METHOD / APPARATUS / PROCEDURE :                                     | SOURCE AND PURITY OF MATERIALS:                                                      |  |  |  |
| Vapor flow apparatus with magnetic                                   | 1. High purity sample, purity 99.69                                                  |  |  |  |
| recirculating pump. Temperature                                      | mole per cent, impurities helium                                                     |  |  |  |
| thermometer, pressure measured with                                  | and nicrogen.                                                                        |  |  |  |
| Bourdon gauge. Samples of gas and                                    | 2. No details given.                                                                 |  |  |  |
| liquid analysed by gas phase inter-<br>ferometry. Details in source. |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      | ESTIMATED ERROR.                                                                     |  |  |  |
|                                                                      | $\delta T/K = \pm 0.02 \pm 0.03$ ; $\delta P$ less than                              |  |  |  |
|                                                                      | 0.2 bar; $\delta x_{\text{He}} \approx \delta y_{\text{He}} = \pm 0.0001 \text{ to}$ |  |  |  |
|                                                                      | 0.0002.                                                                              |  |  |  |
|                                                                      | REFERENCES:                                                                          |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |
|                                                                      |                                                                                      |  |  |  |

| COMPONE                   | ENTS:            |                               |                              | ORIGINA                                 | L MEASURE      | EMENTS:                       |                              |  |
|---------------------------|------------------|-------------------------------|------------------------------|-----------------------------------------|----------------|-------------------------------|------------------------------|--|
| (1) Noon. Not $7440-01-9$ |                  |                               |                              | Stroo                                   | ++ W 1         | and Uill                      | T T E                        |  |
|                           | Neon;            | Ne; 7440-01-9                 |                              | J. Chem. Phys., <u>1971</u> , 54, 5088. |                |                               |                              |  |
| (2)                       | Argon;           | Ar; 7440-37-1                 |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              |                                         |                |                               | 1                            |  |
|                           |                  |                               |                              | ļ                                       |                |                               |                              |  |
| VARIABI                   | LES:             |                               |                              | PREPARE                                 | ED BY:         |                               |                              |  |
| Tempe                     | rature,          | pressure                      |                              | С. L.                                   | Young          |                               |                              |  |
| FYDEDIN                   |                  |                               |                              |                                         |                |                               |                              |  |
|                           | LUIRL VA         | Mole fractio                  | n of neon                    | m /12                                   | Dham           | Mole fracti                   | on of neon                   |  |
| т/к                       | P/bar            | in liquid,<br><sup>x</sup> No | in vapor,<br><sup>y</sup> Ne | TYK                                     | P/bar          | in liquid,<br><sup>x</sup> Ne | in vapor,<br><sup>y</sup> Ne |  |
| 87.34                     | 63.8             | 0.0542                        | 0.9590                       | 92.42                                   | 845.1          | 0.4369                        | 0.7514                       |  |
|                           | 107.4            | 0.0856                        | 0 9485                       |                                         | 896.7<br>934 2 | 0.4479                        | 0.7434                       |  |
|                           | 210.8            | 0.1457                        | 0.9315                       |                                         | 965.6          | 0.4616                        | 0.7342                       |  |
|                           | 273.6            | 0.1713                        | 0.9186                       |                                         | 1000.1         | 0.465                         | 0.729                        |  |
|                           | 275.6            | 0.1766                        | 0.9160                       | 93.01                                   | 872.4          | 0.4868                        | 0.7159                       |  |
|                           | 344.5<br>415 4   | 0.2019                        | 0.9021                       |                                         | 927.1          | 0.5069                        | 0.6856                       |  |
|                           | 454.9            | 0.2373                        | 0.8826                       |                                         | 1010.2         | 0.5431                        | 0.6711                       |  |
|                           | 491.4            | 0.2445                        | -                            |                                         | 1017.3         | 0.5576                        | -                            |  |
|                           | 516.8            | 0.2518                        | -                            |                                         | 1030.5         | 0.560                         | 0.655                        |  |
| 00 47                     | 538.0            | 0.252                         | 0.874                        | 93.25                                   | 606.9<br>693 1 | 0.3858                        | 0.7764                       |  |
| 90.47                     | 622.2            | 0.3272                        | 0.8284                       |                                         | 757.9          | 0.4491                        | -                            |  |
| ł                         | 689.0            | 0.3420                        | 0.8190                       |                                         | 830.9          | -                             | 0.7102                       |  |
|                           | 757.9            | 0.3547                        | 0.8131                       |                                         | 896.7          | 0.5181                        | 0.6835                       |  |
| 91 52                     | 823.8<br>686 0   | 0.365                         | 0.808                        |                                         | 927.1          | 0 5567                        | 0.65//                       |  |
| 91.52                     | 757.9            | 0.3837                        | 0.7892                       | 93.48                                   | 793.4          | 0.4818                        | -                            |  |
|                           | 827.8            | -                             | 0.7827                       |                                         | 862.3          | 0.5339                        | 0.6732                       |  |
|                           | 857.2            | 0.3982                        | 0.7868                       | 0 2 0 1                                 | 885.6          | 0.5672                        | 0.6459                       |  |
| 02 12                     | 902.8<br>361 7   | 0.407                         | 0.785                        | 93.91                                   | 462.0          | 0.3305                        | 0.8120                       |  |
| 92.42                     | 486.4            | 0.3130                        | 0.8280                       |                                         | 651.5          | 0.4318                        | 0.7427                       |  |
|                           | 585.7            | 0.3550                        | 0.8023                       |                                         | 706.2          | 0.4656                        | 0.7171                       |  |
|                           | 631.3            | 0.3707                        | 0.7934                       |                                         | 772.1          | 0.5189                        | 0.6742                       |  |
|                           | 765.0            | 0.4161                        | 0.7654                       |                                         | 796.4          | 0.5572                        |                              |  |
|                           |                  |                               | AUXILIARY                    | INFORMAT                                | TION           |                               |                              |  |
| METHOD,                   | /APPARAT         | US/PROCEDURE:                 |                              | SOURCE                                  | AND PURIT      | Y OF MATERIALS                | :                            |  |
| Recirc                    | culating         | vapor flow a                  | pparatus                     | No details given.                       |                |                               |                              |  |
| with n                    | nagnetic         | pump at ambi                  | ent tempera-                 |                                         |                |                               |                              |  |
| conduc                    | sampı<br>tivitv. | Temperatur                    | e measured                   |                                         |                |                               |                              |  |
| with p                    | olatinum         | resistance t                  | hermometer.                  |                                         |                |                               | l l                          |  |
| Pressi                    | ire meas         | ured using Bo                 | urdon gauge.                 |                                         |                |                               |                              |  |
| Detail                    | ls in re         | f. 1.                         |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              |                                         |                |                               | [                            |  |
|                           |                  |                               |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              | ESTIMAT                                 | ED ERROR:      | •                             |                              |  |
|                           |                  |                               |                              | δ <b>Τ/Κ</b> =                          | = ±0.2;        | $\delta P/\text{bar} = \pm 0$ | .5;                          |  |
|                           |                  |                               |                              | <sup>0</sup> "Ne                        | $y_{Ne} =$     | ±0.001.                       |                              |  |
|                           |                  |                               |                              |                                         | 020            |                               |                              |  |
|                           |                  |                               |                              | REFEREN                                 | ICES:          | N D 2                         |                              |  |
|                           |                  |                               |                              | 1. St<br>5,                             | 27.            | w. B., Cryog                  | enics, <u>1965</u> ,         |  |
|                           |                  |                               |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              |                                         |                |                               | ۱<br>۱                       |  |
|                           |                  |                               |                              |                                         |                |                               |                              |  |
|                           |                  |                               |                              |                                         |                |                               |                              |  |

COMPONENTS : ORIGINAL MEASUREMENTS: (1) Neon; Ne; 7440-01-9 Streett, W. B., J. Chem. Phys., 1967, 46, 3282. (2) Argon; Ar; 7440-37-1 VARIABLES: PREPARED BY: Temperature, pressure C. L. Young **EXPERIMENTAL VALUES:** Mole fraction of neon Mole fraction of neon T/K т/к *P/*bar in liquid, in vapor, P/bar in liquid, in vapor,  $x_{Ne}$ <sup>y</sup>Ne <sup>x</sup>Ne <sup>y</sup>Ne 95.82 103.3 0.0962 0.9245 110.78 122.0 0.1448 0.8278 140.0 0.9165 201.0 0.1290 0.2552 0.7852 208.6 0.1848 0.8925 239.2 0.3237 0.7423 0.2357 276.1 0.8650 272.7 0.4058 0.6781 343.3 0.2842 0.8358 282.0 0.4503 0.6379 417.1 0.3361 0.8046 286.1 0.4898 0.6034 477.8 0.3727 0.7733 75.2 121.36 0.0925 0.6773 99.6 566.1 0.4453 0.7109 0.1348 0.6991 0.4917 593.6 0.6795 141.3 0.2087 0.6906 606.7 0.5139 0.6642 169.6 0.2783 0.6561 187.9 621.2 0.5710 0.6105 0.3341 0.6122 0.8903 195.1 101.94 114.8 0.1213 0.3722 0.5811 132.0 0.1383 \_ 197.9 0.3990 0.5575 206.2 0.2124 0.8543 129.93 93.1 0.1318 0.5572 275.1 0.2887 0.8104 113.1 0.1787 0.5610 344.7 0.3776 0.7536 129.3 0.2228 0.5463 0.5195 382.7 0.4474 0.6932 141.3 0.2668 396.1 0.5188 0.6362 148.9 0.3090 0.4849 0.4573 151.7 0.3309 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus with magnetic pump at ambient tem-No details given. perature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in ref. 1. ESTIMATED ERROR:  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.1;$  $\delta x_{\rm Ne} = \pm 0.001; \quad \delta y_{\rm Ne} = \pm 0.001.$ (estimated by compiler) **REFERENCES:** 1. Streett, W. B., Cryogenics, 1965, 5, 27. 1

| COMPONENTS:              |                          |                 | ORIGINAL MEASUREMENTS:                |                 |                |                        |                       |
|--------------------------|--------------------------|-----------------|---------------------------------------|-----------------|----------------|------------------------|-----------------------|
| (1) Neon; Ne; 7440-01-9  |                          |                 | Streett, W. B., J. Chem. Phys., 1965, |                 |                |                        |                       |
| (2) Argon: Ar: 7440-37-1 |                          |                 | 42, 500                               | •               |                |                        |                       |
| (2) 5                    | igon, AI                 | ; /440-3/-1     | L                                     |                 |                |                        |                       |
|                          |                          |                 |                                       |                 |                |                        |                       |
|                          |                          |                 |                                       |                 |                |                        | I                     |
| VARIABI                  | LES:                     |                 |                                       | PREPARED        | BY:            |                        |                       |
| Temper                   | ature, pre               | essure          |                                       | С. L. Y         | oung           |                        |                       |
|                          |                          |                 |                                       |                 |                |                        |                       |
| EXPERIM                  | ENTAL VALUE              | S:              |                                       |                 | M              | olo fractio            | n of noon             |
| T/K                      | P/bar in                 | liquid,         | in vapor,                             | Т/К             | P/bar i        | n liquid,              | in vapor,             |
|                          |                          | <sup>x</sup> Ne | <sup>y</sup> Ne                       |                 |                | <sup>x</sup> Ne        | ${}^{\mathcal{Y}}$ Ne |
| 84 42                    | 3 83                     | 0 0024          | 0.7984                                | 95.82           | 54.81          | 0 0517                 | 0 9198                |
| 04.42                    | 6.96                     | 0.0052          | 0.8888                                |                 | 69.40          | 0.0652                 | 0.9228                |
|                          | 13.65                    | 0.0111          | 0.9420                                | 101.94          | 7.45           | 0.0038                 | 0.4638                |
|                          | 27.72                    | 0.0229          | 0.9584                                |                 | 21.37          | 0.0192                 | 0.7772                |
|                          | 34.47<br>42 16           | 0.0284          | 0.9662                                |                 | 28.17<br>34.82 | 0.0262                 | 0.8191                |
|                          | 48.19                    | 0.0408          | 0.9668                                |                 | 41.61          | 0.0408                 | 0.8592                |
|                          | 54.99<br>69 19           | 0.0448          | 0.9681                                |                 | 48.57          | 0.0487                 | 0.8694                |
| 87.42                    | 7.48                     | 0.0064          | 0.8486                                |                 | 62.12          | 0.0635                 | 0.8819                |
|                          | 14.13                    | 0.0118          | 0.9107                                | 110.78          | 70.57          | 0.0726                 | 0.8868                |
| 1                        | 27.72                    | 0.0241          | 0.9445                                | 1101/0          | 15.20          | 0.0101                 | 0.4813                |
|                          | 34.44<br>41.64           | 0.0293          | 0.9501<br>0.9552                      |                 | 21.06<br>27.34 | 0.0171                 | 0.5993                |
|                          | 48.16                    | 0.0412          | 0.9582                                |                 | 34.51          | 0.0337                 | 0.7200                |
|                          | 55.22<br>68.88           | 0.0475          | 0.9605<br>0.9623                      |                 | 41.64          | 0.0422                 | 0.7508                |
| 95.82                    | 4.76                     | 0.0020          | 0.4870                                |                 | 69.22          | 0.0764                 | 0.8103                |
|                          | 10.55                    | 0.0079          | 0.7545                                | 121.36          | 20.27          | 0.0092                 | 0.2901                |
|                          | 22.44                    | 0.0194          | 0.8661                                |                 | 36.27          | 0.0329                 | 0.5278                |
|                          | 28.48<br>35.13           | 0.0258          | 0.8892<br>0.8970                      |                 | 42.37<br>58.05 | 0.0417                 | 0.5747                |
|                          | 41.58                    | 0.0387          | 0.9064                                |                 | 69.88          | 0.0833                 | 0.6728                |
| [                        |                          |                 | AUXILIARY                             | INFORMATI       | ON             |                        |                       |
| METHOD                   | /APPARATUS               | /PROCEDURE      | :                                     | SOURCE A        | ND PURITY      | OF MATERIALS:          |                       |
| Recirc                   | ulating va               | por flow a      | pparatus;                             | No de           | tails giv      | ven.                   |                       |
| detail                   | s given in<br>ed with pl | atinum res      | Temperature                           |                 |                |                        |                       |
| thermon                  | meter. P                 | ressure me      | asured using                          |                 |                |                        |                       |
| Bourdo                   | n gauge.<br>analysed     | by thermal      | conduc-                               |                 |                |                        |                       |
| tivity                   | •                        | -               |                                       |                 |                |                        |                       |
|                          |                          |                 |                                       |                 |                |                        |                       |
|                          |                          |                 |                                       |                 |                |                        |                       |
|                          |                          |                 |                                       |                 |                |                        |                       |
| 1                        |                          |                 |                                       | ESTIMATE        | D ERROR:       |                        | ĺ                     |
|                          |                          |                 |                                       | δT/K =          | ±0.01; d       | $\delta P/bar = \pm 0$ | .01;                  |
|                          |                          |                 |                                       | **Ne<br>±0.002. | -0.0002 (      | 0.0004;                | <sup>vy</sup> Ne –    |
|                          |                          |                 |                                       | REFERENC        | ES;            |                        |                       |
|                          |                          |                 |                                       | 1. C+           | reett W        | B. Chuca               | enice 1965            |
|                          |                          |                 |                                       | 5               | 27.            | <b></b>                | <u> </u>              |
|                          | i.                       |                 |                                       |                 | <b>-</b> , ,   |                        |                       |
|                          |                          |                 |                                       | 1               |                |                        |                       |
| J                        |                          |                 |                                       | J               |                |                        |                       |

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ORIGINAL MEASUREMENTS: COMPONENTS: Streett, W. B., J. Chem. Phys., <u>1965</u>, 42, 500. (1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: P/bar Mole fraction of neon T/K in liquid in vapor,  $x_{Ne}$  $y_{Ne}$ 26.44 34.85 0.1703 0.3055 129.93 0.0097 0.0237 42.92 0.0373 0.3877 49.54 0.0487 0.4335 56.19 72.39 0.0603 0.4709 0.0898 0.5277

| COMPONENTS:     |                     |                              |                           | ORIGINAL MEASUREMENTS:                    |                |                               |                            |  |
|-----------------|---------------------|------------------------------|---------------------------|-------------------------------------------|----------------|-------------------------------|----------------------------|--|
| (1) 1           | Neon; Ne            | ; 7440-01-9                  |                           | Skripka, V. G. and Lobonova, N. N.,       |                |                               |                            |  |
| (2) P           | Argon; A            | r; 7440-37-1                 |                           | Trudy Vses. NauchIssled. Inst.            |                |                               |                            |  |
|                 |                     |                              | Kriog.                    | Kriog. Mashinostr., <u>1971</u> , 13, 90. |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
| VARIABI         | LES:                |                              |                           | PREPARED                                  | BY:            |                               |                            |  |
| Temper          | cature, p           | ressure                      |                           | C. L. Y                                   | oung           |                               |                            |  |
| EXPERIN         | MENTAL VAL          | UES:                         |                           | <b>.</b>                                  |                |                               |                            |  |
| т/к             | P/bar               | in liquid,                   | on or neon<br>in vapor,   | т/к                                       | P/bar          | in liquid,                    | in vapor,                  |  |
|                 |                     | <sup>x</sup> Ne              | $y_{Ne}$                  |                                           |                | <sup>x</sup> Ne               | <sup>y</sup> Ne            |  |
| 90.61           | 9.8                 | 0.0092                       | -                         | 99.75                                     | 68.6           | 0.0726                        | 0.8925                     |  |
|                 | 29.4                | 0.0296                       | 0.9245                    |                                           | 88.3           | 0.0936                        | 0.8960                     |  |
|                 | 39.2<br>49 0        | 0.0400                       | 0.9340                    |                                           | 98.1           | 0.1044                        | 0.8960                     |  |
|                 | 58.8                | 0.0604                       | 0.9400                    |                                           | 117.7          | 0.1260                        | 0.8950                     |  |
|                 | 68.6<br>78.5        | 0.0706                       | 0.9395                    |                                           | 127.5          | 0.1370                        | 0.8935                     |  |
|                 | 88.3                | 0.0911                       | 0.9390                    |                                           | 147.1          | 0.1590                        | 0.8870                     |  |
|                 | 98.1                | 0.1005                       | 0.9380                    |                                           | 156.9          | 0.1705                        | 0.8835                     |  |
|                 | 117.7               | 0.1185                       | 0.9350                    |                                           | 176.5          | 0.1920                        | 0.8760                     |  |
|                 | 127.5               | 0.1275                       | 0.9330                    | -                                         | 186.3          | 0.2025                        | 0.8720                     |  |
|                 | 147.1               | 0.1452                       | 0.9290                    | 109.67                                    | 198.1          | 0.0140                        | 0.8690                     |  |
|                 | 156.9               | 0.1538                       | 0.9270                    |                                           | 29.4           | 0.0273                        | -                          |  |
|                 | 176.5               | 0.1700                       | 0.9220                    |                                           | 49.0           | 0.0404                        | 0.7580                     |  |
|                 | 186.3               | 0.1775                       | 0.9200                    |                                           | 58.8           | 0.0675                        | 0.7800                     |  |
| 99.75           | 9.8                 | 0.0079                       | -                         |                                           | 78.5           | 0.0930                        | 0.8070                     |  |
|                 | 19.6                | 0.0189                       | -                         |                                           | 88.3           | 0.1060                        | 0.8150                     |  |
|                 | 39.2                | 0.0298                       | 0.8635                    |                                           | 107.9          | 0.1320                        | 0.8180                     |  |
|                 | 49.0<br>58.8        | 0.0510                       | 0.8780<br>0.8865          |                                           | 117.7<br>127.5 | 0.1450<br>0.1594              | 0.8000                     |  |
|                 |                     |                              | AUXILIARY                 | INFORMATI                                 | ON             |                               |                            |  |
| METHOD          | /APPARAT            | US/PROCEDURE                 | :                         | SOURCE A                                  | ND PURITY      | OF MATERIALS:                 |                            |  |
| Rockin          | g autocl            | ave partiall                 | y filled                  | 1. High purity sample, purity 99.7        |                |                               |                            |  |
| with l<br>gas.  | iquid an<br>Samples | d then press<br>of phases a  | urized with<br>nalvsed bv | mole per cent.                            |                |                               |                            |  |
| interf          | erometry            | . Temperati                  | ure measu-                | 2. High mole                              | purity         | sample, pur                   | ity 99.99                  |  |
| red wi<br>meter | th platimand pres   | num resistan<br>sure measure | ce thermo-<br>1 with      |                                           | per ee         |                               |                            |  |
| Bourdo          | n gauge.            | Details in                   | n source.                 |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           | ESTIMATE                                  | D ERROR:       | N. 7. 1                       |                            |  |
|                 |                     |                              |                           | $\delta T/K = 1$                          | ±0.01;         | $\delta P/\text{bar} = \pm 0$ | $.4;  \delta x_{\rm Ne} =$ |  |
|                 |                     |                              |                           | $\delta y_{\rm Ne} =$                     | ±0.0002        | •                             |                            |  |
|                 |                     |                              |                           | REFERENC                                  | CES:           |                               | I                          |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |
|                 |                     |                              |                           |                                           |                |                               |                            |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 Skripka, V. G. and Lobonova, N. N., (1) Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, 13, 90. (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: Mole fraction of neon т/к P/bar in liquid, in vapor,  $x_{Ne}$  $y_{Ne}$ 109.67 137.3 0.1736 0.8155 147.1 0.1882 0.8125 156.9 0.2034 0.8080 166.7 0.2180 0.8020 176.5 0.2328 0.7950 186.3 0.2484 0.7830 196.1 0.2644 0.7695 205.9 0.2814 120.09 19.6 0.0110 -29.4 0.0260 \_ 39.2 0.0400 0.5370 49.0 0.0555 0.5935 58.8 0.0700 0.6028 68.6 0.0860 0.6510 78.5 0.1020 0.6670 88.3 0.1180 0.6765 98.1 0.1350 0.6840 107.9 0.1530 0.6880 117.7 0.1720 0.6880 127.5 0.1925 0.6835 137.3 0.2140 0.6780 147.1 0.2360 0.6705 156.9 0.2610 0.6605 0.6490 166.7 0.2870 176.5 0.3140 0.6365

| COMPONIENT                               |                     |                                |                                        | OPTOTNAT                         | MEA CUDEN              | NTC .                              |                  |
|------------------------------------------|---------------------|--------------------------------|----------------------------------------|----------------------------------|------------------------|------------------------------------|------------------|
| COMPONENTS:                              |                     |                                |                                        | ORIGINAL MEASUREMENTS:           |                        |                                    |                  |
| (1) Neon; Ne; 7440-01-9                  |                     |                                |                                        | Trappeniers, N. J. and Schouten, |                        |                                    |                  |
| (2) $\lambda rgon: \lambda r. 7440-27-1$ |                     |                                | J. A., Physica, <u>1974</u> , 73, 539. |                                  |                        |                                    |                  |
| (2) A                                    | raon'               | ar, 1440-37=.                  | ±                                      |                                  |                        |                                    |                  |
| }                                        |                     |                                |                                        |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
| VARIABLE                                 | S:                  |                                |                                        | PREPARED                         | BY:                    |                                    |                  |
| 1                                        |                     |                                |                                        |                                  |                        |                                    |                  |
| Temper                                   | ature,              | pressure                       |                                        | C. L.                            | Young                  |                                    |                  |
| EXPERIME                                 | NTAL VALU           | <br>ES:                        |                                        | I                                |                        |                                    |                  |
|                                          |                     | Mole fracti                    | on of neon                             | <b>_</b> /                       | - <i>1</i>             | Mole fracti                        | on of neon       |
| T/K                                      | <i>P/</i> bar       | in liquid,                     | in vapor,<br>"                         | Т/К                              | P/bar                  | in liquid,                         | in vapor,        |
|                                          |                     | ~Ne                            | <sup>9</sup> Ne                        |                                  |                        | ~Ne                                | <sup>9</sup> Ne  |
| 137.83                                   | 36.02               | 0.0140                         | 0.1252                                 | 121.32                           | 50.78                  | 0.0545                             | 0.6176           |
| {                                        | 45.94               | 0.0342                         | 0.2280                                 |                                  | 66.03<br>81 35         | 0.0766                             | 0.6640           |
| 1                                        | 81.55               | 0.1137                         | 0.3830                                 |                                  | 101.53                 | 0.1355                             | 0.7042           |
|                                          | 96.68               | 0.1594                         | 0.3930                                 |                                  | 126.80                 | 0.1801                             | 0.7026           |
|                                          | 101.46              | 0.1753                         | 0.3923                                 |                                  | 152.12<br>177.45       | U.2312<br>0.2958                   | 0.6911<br>0.6492 |
|                                          | 111.80              | 0.2334                         | 0.3614                                 |                                  | 192.63                 | 0.3510                             | 0.6038           |
| 129.94                                   | 25.65               | 0.0086                         | 0.1559                                 | 102 04                           | 202.74                 | 0.4274                             | 0.5335           |
| 1                                        | 35.04               | 0.0232                         | 0.4143                                 | 103.04                           | 20.43                  | 0.0187                             | 0.5709           |
| ł                                        | 55.91               | 0.0593                         | 0.4745                                 |                                  | 50.98                  | 0.0523                             | 0.8635           |
|                                          | 71.06               |                                | 0.5280                                 |                                  | 91.32                  | 0.0966                             | 0.8853           |
| 1                                        | 101.42              | 0.1497                         | 0.5678                                 |                                  | 212.90                 | 0.2246                             | 0.8431           |
|                                          | 116.61              | 0.1837                         | 0.5642                                 |                                  | 273.69                 | 0.2983                             | 0.8059           |
| 1                                        | 138.69              | 0.2114<br>0.2432               | 0.5568<br>0.5390                       |                                  | 334.48<br>364 87       | 0.3846<br>0.4475                   | 0.7440           |
| 1                                        | 142.00              | 0.2641                         | 0.5247                                 |                                  | 374.99                 | 0.4853                             | 0.6549           |
|                                          | 143.96              | -                              | 0.5193                                 | 93.22                            | 608.06                 | 0.3822                             | 0.7817           |
| )                                        | 153.13              | 0.2963                         | 0.5042                                 |                                  | 982.92                 | 0.5405                             | 0.6593           |
| 121.32                                   | 18.76               | 0.0810                         | 0.2488                                 | 92.84                            | 5.52                   | 0.0023                             | 0.6578           |
|                                          | 25.68               | 0.0168                         | 0.4038                                 |                                  | 10.30                  |                                    | 0.8057           |
|                                          |                     |                                | ·····                                  |                                  | 20.04                  | 0.01/1                             | 0.0900           |
|                                          |                     |                                | AUXILIARY                              | INFORMAT                         | ION                    |                                    |                  |
| METHOD /                                 |                     | IS / PROCEDUPE                 |                                        | SOURCE                           |                        | OF MATERIALS.                      |                  |
|                                          | high                |                                | •<br>libwi ]]                          | No details given                 |                        |                                    |                  |
| Static<br>  Pressu                       | nign p:<br>re measu | ressure equi:<br>ared with dea | ad weight                              | . No details given.              |                        |                                    |                  |
| balanc                                   | e and to            | emperature w                   | ith resis-                             |                                  |                        |                                    |                  |
| tance                                    | thermome            | eter. Sampi<br>nductivity      | les analysed                           |                                  |                        |                                    |                  |
| ref. 1                                   | •                   | auctivity.                     | Decails III                            |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
| 1                                        |                     |                                |                                        |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        | ESTIMAT                          | ED ERROR.              |                                    | ·····            |
|                                          |                     |                                |                                        | δτ/κ =                           | = ±0.003               | $\delta P/bar =$                   | ±0.1 or          |
|                                          |                     |                                |                                        | better                           | $z; \delta x_{\rm NC}$ | $\simeq \delta y_{\rm NO} = \pm 0$ | .0005.           |
|                                          |                     |                                |                                        |                                  | Ne                     | 116                                |                  |
|                                          |                     |                                |                                        | REFEREN                          | CES:                   |                                    |                  |
| [                                        |                     |                                |                                        | 1. Tra                           | ppeniers               | s, N. J. and                       | Schouten,        |
|                                          |                     |                                |                                        | J.                               | A., Phys               | sica, <u>1974</u> ,                | 73, 527.         |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
|                                          |                     |                                |                                        |                                  |                        |                                    |                  |
| 1                                        |                     |                                |                                        |                                  |                        |                                    |                  |

ORIGINAL MEASUREMENTS: COMPONENTS: Trappeniers, N. J. and Schouten, J. A., Physica, <u>1974</u>, 73, 539. (1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: Mole fraction of neon P/bar in liquid, in vapor, т/к in vapor, <sup>x</sup>Ne <sup>y</sup>Ne 0.9350 50.77 92.84 0.0457 91.31 0.0837 0.9420 0.1131 0.9345 126.81 0.9236 167.28 0.1435 207.81 0.1707 0.9110 0.1992 253.49 0.8948 304.10 0.2297 0.8791 354.76 0.2575 0.8635 0.2794 0.8525 405.39 648.56 0.3818 0.7832 0.4870 952.55 0.7195 1013.4 solid phase 0.7225

.

| COMPON | ENTS:                  | EVALUATOR:                |  |  |
|--------|------------------------|---------------------------|--|--|
| 1.     | Neon; Ne; 7440-01-9    | Colin Young,              |  |  |
|        |                        | School of Chemistry,      |  |  |
| 2.     | Krypton; Kr; 7439-90-9 | University of Melbourne,  |  |  |
|        |                        | Parkville, Victoria 3052, |  |  |
|        |                        | AUSTRALIA.                |  |  |

CRITICAL EVALUATION:

There are three sets of measurement on this system. The first measurements by Trappeniers and Schouten (1) were presented in graphical form and were undertaken to establish that this system exhibits gas-gas immiscibility of the second kind (2). These data are rejected. The measurements by Miller *et al.* (3) are restricted to pressures up to 100 bar between 120 K and 150 K and the mole fraction of neon in the liquid phase is generally slightly greater than the value obtained by interpolation of the more extensive data reported by Trappeniers and Schouten in their second paper (4). Both sets of measurement in references (3) and (4) were made with apparatus capable of good precision results and therefore both are classified as tentative.

- 1. Trappeniers, N. J. and Schouten, J. A., Phys. Lett., 1968, A27, 340.
- Scheider, G. M., in Chemical Thermodynamics Vol. 2 Special Periodical Report, Chapter 4, ed. McGlashan, M. L., Chemical Society, 1978.
- 3. Miller, R. C., Kidnay, A. J. and Hiza, M. J., J. Chem. Thermodynamics, <u>1972</u>, 4, 807.
- 4. Trappeniers, N. J. and Schouten, J. A., Physica, 1974, 73, 546.

| COMPONENTS:                |                  |                  |             | ORIGINAL MEASUREMENTS:              |                       |                               |                 |  |
|----------------------------|------------------|------------------|-------------|-------------------------------------|-----------------------|-------------------------------|-----------------|--|
| (l) N                      | eon; Ne;         | ; 7440-01-9      |             | Trappeniers, N. J. and Schouten, J. |                       |                               |                 |  |
| (2) Krypton; Kr; 7439-90-9 |                  |                  |             | A., Physica, 1974, 73, 548.         |                       |                               |                 |  |
| (_, _,                     | -11              |                  | -           |                                     | ·                     |                               |                 |  |
|                            |                  |                  |             |                                     |                       |                               |                 |  |
| VARIABL                    | ES:              | <u> </u>         |             | PREPARED                            | BY:                   |                               |                 |  |
| Temper                     | ature, pi        | ressure          |             | С. L. Y                             | oung                  |                               |                 |  |
|                            | <u></u>          |                  |             |                                     |                       |                               |                 |  |
| EXPERIM                    | ENTAL VALU       | ES:              |             |                                     | -                     |                               |                 |  |
| т/к                        | P/bar            | in liquid,       | in vapor,   | т/к                                 | P/bar :               | in liquid,                    | in vapor,       |  |
|                            |                  | $x_{Ne}$         | $^{y}$ Ne   |                                     |                       | <sup>x</sup> Ne               | <sup>y</sup> Ne |  |
| 178.15                     | 41.01            | 0.0180           | 0.3731      | 163.15                              | 41.01                 | 0.0203                        | 0.6257          |  |
|                            | 61.21            | 0.0354<br>0.0718 | 0.5190      |                                     | 61.09                 | 0.0335                        | 0.7182          |  |
|                            | 152.16           | 0.1186           | 0.6890      |                                     | 202.73                | 0.1224                        | 0.8329          |  |
|                            | 202.74           | 0.1645           | 0.7023      |                                     | 304.06                | 0.1805                        | 0.8330          |  |
|                            | 304.01           | 0.2660           | 0.6810      |                                     | 405.37                | 0.2329                        | 0.8237          |  |
|                            | 385.07           | 0.3850           | 0.6192      |                                     | 608.01                | 0.3253                        | 0.7963          |  |
|                            | 395.19           | 0.4070           | 0.6001      |                                     | 709.33                | 0.3628                        | 0.7836          |  |
| 166 15                     | 405.37           | 0.4531           | 0.5621      |                                     | 810.65                | 0.3957                        | 0.7723          |  |
| 100.13                     | 41.01            | 0.0200           | 0.5821      |                                     | 1114.6                | 0.4637                        | 0.7523          |  |
| ļ                          | 61.19            | 0.0359           | 0.6834      |                                     | 1215.9                | 0.4731                        | 0.7530          |  |
|                            | 101.18           | 0.0618           | 0.7642      |                                     | 1317.2                | -                             | 0.7576          |  |
|                            | 304.03           | 0.1927           | 0.8124      |                                     | 1621.2                | 0.4740                        | 0.7842          |  |
|                            | 405.34           | 0.2525           | 0.7992      |                                     | 1874.5                | 0.4421                        | 0.8092          |  |
|                            | 506.66           | 0.3109           | 0.7799      | 148.15                              | 15.85                 | 0.0056                        | 0.5738          |  |
|                            | 607.98<br>709 30 | 0.3658           | 0.7587      |                                     | 25.92                 |                               | 0.7204          |  |
|                            | 835.95           | 0.4958           | 0.6913      |                                     | 61.17                 | 0.0288                        | 0.8529          |  |
|                            | 881.54           | 0.5346           | 0.6598      |                                     | 101.28                | 0.0476                        | 0.8899          |  |
| 166.25                     | 1823.9           | 0.6042           | 0.6800      |                                     | 202.74                | 0.0916                        | 0.9074          |  |
| 163.15                     | 25.93            | 0.0090           | 0.4678      |                                     | 405.33                | 0.1598                        | 0.9035          |  |
|                            |                  |                  | AUXILIARY   | INFORMATI                           | ON                    |                               |                 |  |
| METHOD                     | APPARATU         | IS/PROCEDURE     |             | SOURCE A                            | ND PURITY             | OF MATERIALS:                 |                 |  |
| Static                     | high pre         | essure equili    | brium cell. | No details given.                   |                       |                               |                 |  |
| Pressu                     | re measur        | ed with dead     | l weight    |                                     |                       |                               |                 |  |
| balance                    | e and tem        | nperature wit    | ch resis-   |                                     |                       |                               |                 |  |
| by the                     | cmal cond        | luctivity.       | Details in  |                                     |                       |                               |                 |  |
| source                     | and ref.         | 1.               |             |                                     |                       |                               |                 |  |
|                            |                  |                  |             |                                     |                       |                               |                 |  |
|                            |                  |                  |             |                                     |                       |                               |                 |  |
|                            |                  |                  |             |                                     |                       |                               |                 |  |
|                            |                  |                  |             |                                     |                       |                               |                 |  |
|                            |                  |                  |             | FOTTMATE                            |                       |                               |                 |  |
| [                          |                  |                  |             | $\delta T/K = $                     | ±0.003;               | $\delta P/\text{bar} = \pm 0$ | .1 or better    |  |
|                            |                  |                  |             | $\delta x_{\rm Ne}$ , $\delta y$    | $y_{\rm Ne} = \pm 0.$ | 005.                          |                 |  |
|                            |                  |                  |             | REFERENC                            | CES:                  |                               |                 |  |
|                            |                  |                  |             | 1. Tra                              | ppeniers,             | N. J. and                     | Schouten,       |  |
|                            |                  |                  |             | J. 7                                | A. Phusi              | ca. 1974. 7                   | 3, 527.         |  |
| 1                          |                  |                  |             |                                     |                       | , <u></u> , ,                 | -,              |  |
| l                          |                  |                  |             |                                     |                       |                               |                 |  |
|                            |                  |                  |             |                                     |                       |                               |                 |  |

| Components:             |           |                    |                 | ORIGI         | ORIGINAL MEASUREMENTS:              |                       |                 |  |
|-------------------------|-----------|--------------------|-----------------|---------------|-------------------------------------|-----------------------|-----------------|--|
| (1) Neon; Ne; 7440-01-9 |           |                    |                 | Trappe        | Trappeniers, N. J. and Schouten, J. |                       |                 |  |
| (2) F                   | (rvpton:  | Kr: 7439-90-       | 9               | A., P         | iysica, <u>1</u>                    | <u>.974</u> , 73, 540 | 3.              |  |
| (=) -                   |           | ,                  | -               |               |                                     |                       |                 |  |
|                         |           |                    |                 |               |                                     |                       |                 |  |
| FYDEDT                  | MENTAL V  | ALUES.             |                 |               |                                     | <u></u>               | <u></u>         |  |
| DAT DAT                 |           | ALOLD.             |                 |               |                                     |                       |                 |  |
| m /12                   | 7) /haw   | Mole fractio       | on of neon      | m /12         | 7) /haw                             | Mole fraction         | on of neon      |  |
| T/K                     | P/Dar     | In liquid, $x_{-}$ | in vapor,       | 17K           | P/Dar                               | $x_{-}$               | In vapor,       |  |
|                         |           | <sup>™</sup> Ne    | <sup>3</sup> Ne |               |                                     | Ne                    | <sup>3</sup> Ne |  |
| 148.15                  | 506.66    | 0.1863             | 0.9002          | 123.17        | 131.88                              | -                     | 0.9703          |  |
|                         | 607.97 0. | 0.2071             | 0.8976          |               | 182.51                              | 0.0497                | 0.9717          |  |
|                         | 709.30    | 0.2230             | 0.8958          |               | 253.38                              | 0.0629                | 0.9705          |  |
|                         | 810.62    | 0.2356             | 0.8943          |               | 354.65                              | 0.0798                | 0.9691          |  |
|                         | 1215.9    | 0.2594             | 0.9003          | 164 02        | 456.03                              | 0.0896                | 0.9693          |  |
|                         | 1074 5    | 0.2624             | 0.9085          | 164.92        | 1063.9                              | 0.53/3                | 0.6842          |  |
| 122 16                  | 18/4.5    | 0.2579             | 0.9100          |               | 14.0                                | 0.58/3                | 0.0045          |  |
| 133.10                  | 15 94     | 0.0020             | 0.0000          |               | 1510 0                              | 0.5630                | 0.0700          |  |
|                         | 25 91     | 0.0037             | 0.8122          | 164 725       | 1083 5                              | 0.5392                | 0.6836          |  |
|                         | 40 99     | 0.0158             | 0.0175          | 104.725       | 1215 9                              | 0.5592                | 0.6469          |  |
|                         | 61.06     | 0.0233             | 0.9331          |               | 1317.2                              | 0.5910                | 0.6546          |  |
|                         | 101.28    | 0.0371             | 0.9474          |               | 1418.6                              | 0,5668                | 0.6948          |  |
|                         | 202.70    | 0.0673             | 0.9526          | 164.685       | 1216.0                              | 0.5778                | 0.6631          |  |
|                         | 304.08    | 0.0916             | 0.9500          |               | 1246.4                              | 0.5817                | 0.6644          |  |
|                         | 405.39    | 0.1113             | 0.9490          |               | 1266.6                              | 0.5816                | 0.6637          |  |
|                         | 506.70    | 0.1252             | 0.9461          |               | 1286.8                              | 0.5827                | 0.6661          |  |
|                         | 608.00    | 0.1372             | 0.9449          |               | 1317.2                              | 0.5762                | 0.6706          |  |
|                         | 709.31    | 0.1461             | 0.9448          | 164.665       | 810.65                              | 0.4303                | 0.7424          |  |
|                         | 810.02    | 0.1519             | 0.9455          |               | 1114.58                             | 0.5440                | 0.6825          |  |
|                         | 1013.25   | 0.1618             | 0.9517          |               | 1215.90                             | 0.5710                | 0.6670          |  |
| 123.17                  | 5.43      | 0.0015             | -               |               | 1257.3                              | 0.5742                | 0.6679          |  |
|                         | 8.18      | 0.0026             | 0.8217          |               | 1266.7                              | 0.5770                | 0.6892          |  |
|                         | 15.83     | 0.0053             | 0.9032          |               | 1297.0                              | 0.5738                | 0.6703          |  |
|                         | 25.88     | 0.0089             | 0.9354          |               | 1337.5                              | 0.5700                | 0.6793          |  |
|                         | 30.89     | 0.0100             | 0.9432          |               | 1418.6                              | 0.5597                | 0.6980          |  |
|                         | 51.06     | 0.0162             | 0.9597          |               | 1519.9                              | 0.5393                | 0.7208          |  |
|                         | 91.43     | 0.0275             | 0.9695          |               | 10/4.5                              | 0.4004                | 0.7794          |  |
|                         |           |                    |                 | 10 <b>0</b> , |                                     |                       |                 |  |
|                         |           |                    |                 |               |                                     |                       |                 |  |
|                         |           |                    |                 |               |                                     |                       |                 |  |
|                         |           |                    |                 |               |                                     |                       |                 |  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Neon; Ne; 7440-01-9 Miller, R. C., Kidnay, A. J. and Hiza, M. J., J. Chem. Thermodynamics, (2) Krypton; Kr; 7439-90-9 1972, 4, 807. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: т/к Mole fraction of neon in liquid phase,  $x_{\rm Ne}$ P/bar 120.00 10.31 0.00310 20.09 0.00653 32.53 0.0110 45.29 0.0152 0.0204 61.5 81.9 0.0264 100.3 0.0320 130.00 10.63 0.00341 20.98 0.00798 40.02 0.0160 54.3 0.0215 67.3 0.0264 102.4 0.0399 0.00443 140.00 13.04 23.81 0.0101 39.74 0.0181 60.69 0.0283 81.8 0.0385 100.4 0.0472 150.00 13.22 0.00380 26.24 0.0122 43.22 0.0221 61.3 0.0326 81.3 0.0455 102.3 0.0564 AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: Recirculating vapor-flow apparatus. No details given. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Gas and liquid samples analysed by gas chromatography. Details in source and ref. 1 and 2. ESTIMATED ERROR:  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.05;$  $\delta x_{\rm Ne} \simeq \delta y_{\rm Ne} = \pm 5$ %. **REFERENCES**: 1. Kidnay, A. J., Miller, R. C. and Hiza, M. J., Ind. Eng. Chem. Fund. <u>1971</u>, *10*, 459. Duncan, A. G. and Hiza, M. J., 2. A.I.Ch.E.J., 1970, 16, 733.

| COMPONE | ENTS:                                | EVALUATOR:                |  |  |
|---------|--------------------------------------|---------------------------|--|--|
| 1.      | Neon: Ne: 7440-01-9                  | Colin Young,              |  |  |
|         | Neony Ney 1440 02 5                  | School of Chemistry,      |  |  |
| 2       | Nitrogen: N <sub>2</sub> : 7727-37-9 | University of Melbourne,  |  |  |
|         |                                      | Parkville, Victoria 3052, |  |  |
|         |                                      | AUSTRALIA.                |  |  |

CRITICAL EVALUATION:

This system has been studied by three groups. The work of Burch (1) was restricted to two temperatures and relatively low pressures but is in good agreement with data obtained in the more extensive study of Streett (2.3). The early work of Skripka and Dykhno (4) was limited to pressures up to 25 bar and is probably of lower accuracy than the more recent work of Skripka and Lobonova (5). The work of Skripka and Lobonova (5) is in good agreement with the work of Streett (2,3) where the temperature and pressure ranges overlap. The data of Burch (1) and Skripka and Dykhno (4) are classified as restricted data of moderate accuracy whereas that of Streett (2,3) and Skripka and Lobonova (5) are classified as tentative. Because of partly overlapping but different ranges of temperature and pressure studied it is not desirable to classify either of the latter works as recommended at present.

- 1. Burch, R. J., J. Chem. Engng. Data, <u>1964</u>, 9, 19.
- 2. Streett, W. B., Cryogenics, 1968, 8, 88.
- 3. Streett, W. B., Cryogenics, 1965, 5, 27.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., 1964, no. 8, 163.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no. 13, 90.

| COMPONENTS :                                                                                                                                                                                                                            | ORIGINAL MEASUREMENTS:                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>(1) Neon; Ne; 7440-01-9 (2) Nitrogen; N<sub>2</sub>; 7727-37-9</pre>                                                                                                                                                               | Burch, R. J., J. Chem. Eng. Data,<br><u>1964</u> , 9, 19.                                                                                                                                           |
| VARIABLES:                                                                                                                                                                                                                              |                                                                                                                                                                                                     |
| Temperature, pressure                                                                                                                                                                                                                   | C. L. Young                                                                                                                                                                                         |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                    |                                                                                                                                                                                                     |
| T/K P/bar 10 <sup>2</sup> mole fraction                                                                                                                                                                                                 | n of neon in liquid, in vapor,<br>$10^2 x_{\rm Ne}^2$ $10^2 y_{\rm Ne}^2$                                                                                                                           |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                    | $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                |
| AUXILIARY                                                                                                                                                                                                                               | INFORMATION                                                                                                                                                                                         |
| METHOD /APPARATUS/PROCEDURE:                                                                                                                                                                                                            | SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                     |
| Single pass flow method. Vapor<br>passed through magnetically stirred<br>cell. Temperature measured using<br>thermocouple and pressure measured<br>with Bourdon gauge. Liquid and<br>vapor samples analysed using mass<br>spectrometer. | <ol> <li>Airco spectroscopic sample purity<br/>better than 99.985 mole per cent.</li> <li>Airco prepurified sample purity<br/>better than 99.997 mole per cent.<br/>(Details in source.)</li> </ol> |
|                                                                                                                                                                                                                                         |                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                         | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.2;  \delta P/bar = \pm 0.007 \text{ at } 5.066$<br>bar = $\pm 0.07$ at other pressures;<br>$\delta x_{\text{Ne}} \leq \pm 2$ % (Details in source.)         |
|                                                                                                                                                                                                                                         | REFERENCES :                                                                                                                                                                                        |

| COMPONENT             | S:                          |                     | ORIGINAL MEASUREMENTS:                                                       |                                                                                            |  |  |  |
|-----------------------|-----------------------------|---------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--|--|--|
| (1) N                 | eon; Ne; 7                  | 440-01-9            | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses, Nouch - Issled Inst         |                                                                                            |  |  |  |
| (2) N                 | itrogen; N                  | 2; 7727-37-9        | Kriog. Mashinstr.                                                            | , <u>1964</u> , <i>8</i> , 163.                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
| VARIABLES             | 5:                          |                     | PREPARED BY:                                                                 |                                                                                            |  |  |  |
| Tempera               | ature, pres                 | sure                | C. L. Young                                                                  |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
| EXPERIMEN             | TAL VALUES:                 |                     | Mole fract                                                                   | ion of neon                                                                                |  |  |  |
| т/к                   | P/bar                       | P <sup>+</sup> /bar | in liquid, <i>x</i> <sub>Ne</sub>                                            | in vapor, y <sub>Ne</sub>                                                                  |  |  |  |
| 67.4                  | 6.03                        | 5.77                | 0.0180                                                                       | 0.9577                                                                                     |  |  |  |
|                       | 11.08                       | 10.82               | 0.0343                                                                       | 0.9733                                                                                     |  |  |  |
|                       | 21.22                       | 20.95               | 0.0663                                                                       | 0.9805                                                                                     |  |  |  |
|                       | 26.27                       | 26.01               | 0.0837                                                                       | 0.9824                                                                                     |  |  |  |
| 72.0                  | 6.03                        | 5.49                | 0.0164                                                                       | 0.9052                                                                                     |  |  |  |
|                       | 11.08                       | 10.55               | 0.0315                                                                       | 0.9429                                                                                     |  |  |  |
|                       | 21.27                       | 20.73               | 0.0620                                                                       | 0.9620                                                                                     |  |  |  |
|                       | 26.24                       | 25.71               | 0.0772                                                                       | 0.9664                                                                                     |  |  |  |
| 78.0                  | 5.92                        | 4.78                | 0.0140                                                                       | 0.7933                                                                                     |  |  |  |
|                       | 11.07                       | 9.94                | 0.0287                                                                       | 0.8792                                                                                     |  |  |  |
|                       | 21 26                       | 20.12               | 0.0595                                                                       | 0.9092                                                                                     |  |  |  |
|                       | 26.27                       | 25.14               | 0.0740                                                                       | 0.9332                                                                                     |  |  |  |
| 84.0                  | 6.07                        | 3.98                | 0.0114                                                                       | -                                                                                          |  |  |  |
|                       | 11.06                       | 8.98                | 0.0249                                                                       | 0.7753                                                                                     |  |  |  |
|                       | 16.13<br>21 19              | 14.04               | 0.0390                                                                       | 0.8348                                                                                     |  |  |  |
|                       | 26.16                       | 24.07               | 0.0670                                                                       | 0.8819                                                                                     |  |  |  |
| 90.3                  | 6.03                        | 2.25                | 0.0070                                                                       | _                                                                                          |  |  |  |
|                       | 11.06                       | 7.29                | 0.0219                                                                       | -                                                                                          |  |  |  |
|                       | 16.24                       | 12.46               | 0.0364                                                                       | 0.6953                                                                                     |  |  |  |
|                       | 21.25                       | 22.48               | 0.0667                                                                       | 0.7948                                                                                     |  |  |  |
| <b>b</b> + <b>b</b> - | rtial proces                | ure of noon         |                                                                              |                                                                                            |  |  |  |
| pa.                   | iciai piess                 |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             | AUXILIARY           | INFORMATION                                                                  |                                                                                            |  |  |  |
| METHOD /              | APPARATUS/P                 | ROCEDURE :          | SOURCE AND PURITY OF                                                         | MATERIALS:                                                                                 |  |  |  |
| Vapor :               | flow appara                 | tus with magnetic   | 1. High purity sample, purity 99.69                                          |                                                                                            |  |  |  |
| recirci               | ulating pump<br>od with pla | p. Temperature      | mole per cent; impurities helium                                             |                                                                                            |  |  |  |
| thermon               | meter, pres                 | sure measured with  | 2. Purity 99.5 m                                                             | ole per cent: oxygen                                                                       |  |  |  |
| Bourdon               | n gauge.                    | Samples of gas and  | main impurity                                                                | ·                                                                                          |  |  |  |
| liquid                | analysed b                  | y gas phase inter-  |                                                                              |                                                                                            |  |  |  |
| ferome                | try. Deta                   | ils in source.      |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     | ESTIMATED ERROR:                                                             |                                                                                            |  |  |  |
|                       |                             |                     | $\delta T/K = \pm 0.02 \pm 0$<br>0.2 bar; $\delta x_{Ne} \approx$<br>0.0002. | $\delta y_{\rm Ne}^{\delta P}$ less than<br>$\delta y_{\rm Ne}^{\delta y} = \pm 0.0001$ to |  |  |  |
|                       |                             |                     | REFERENCES                                                                   |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |
|                       |                             |                     |                                                                              |                                                                                            |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Neon; Ne; 7440-01-9 Streett, W. B., Cryogenics, 1968, 8, (2) Nitrogen; N<sub>2</sub>; 7727-37-9 88. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of neon Mole fraction of neon т/к P/bar in liquid, in vapor, T/K P/bar in liquid, in vapor,  $x_{Ne}$  $y_{Ne}$  $x_{\rm Ne}$ <sup>y</sup>Ne 66.13 79.9 0.2293 86.19 147.1 0.5570 0.7209 89.6 0.5862 0.2546 0.9634 148.5 0.7125 99.9 0.2783 90.65 78.2 0.2316 0.8498 0.9447 127.6 99.1 0.3061 0.8258 134.5 0.3527 111.7 0.8053 0.3638 160.6 0.4140 0.9061 132.7 0.4826 0.7409 0.4702 0.8629 137.5 0.5278 184.7 0.7111 216.4 0.5689 0.7765 100.78 89.0 0.2832 219.9 0.5946 103.4 0.3579 0.6793 77.35 101.3 0.2988 0.9196 111.0 0.4152 0.6396 135.5 0.4172 0.8691 114.1 0.4578 0.6027 0.7981 158.6 0.5261 108.91 82.1 0.5535 87.2 0.3113 0.5325 166.1 0.6004 0.7315 98.2 86.19 90.3 0.3404 0.5107 0.2984 0.8723 0.4892 114.8 0.3640 0.8424 92.0 0.2617 132.3 0.4438 0.8050 114.34 74.2 0.4029 141.7 0.5019 0.7669 AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: Recirculating vapor flow with magnetic No details given. Samples of phases analysed by pump. thermal conductivity. Temperature measured with platinum resistance thermometer and pressure measured with Details in ref. 1. Bourdon gauge. ESTIMATED ERROR:  $\delta T/K = \pm 0.02; \quad \delta P/bar = \pm 0.1;$ <sup>δ</sup>*x*<sub>Ne</sub> <sup>≃</sup>  $\delta y_{\rm Ne}$  = ±0.0005 (estimated by compiler) **REFERENCES**: 1. Streett, W. B., Cryogenics, 1965, 5, 27.

| COMPONENTS:                                                                                                                                                                                                                                                          |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | ORIGINAL MEASUREMENTS:                                                                                                             |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| (1) Neon; Ne; 7440-01-9                                                                                                                                                                                                                                              |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | Skripka, V. G. and Lobonova, N. N.,                                                                                                |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| (2) Nitrogen; N <sub>2</sub> ; 7727-37-9                                                                                                                                                                                                                             |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | Trudy Vses. NauchIssled. Inst.                                                                                                     |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | Kriog. Mashinostr., <u>1971</u> , 13, 90.                                                                                          |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| VARIABLES:                                                                                                                                                                                                                                                           |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | PREPARED BY:                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| Temperature, pressure                                                                                                                                                                                                                                                |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | C. L. Young                                                                                                                        |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| EXPERIMEN                                                                                                                                                                                                                                                            | NTAL VALU                                                                                                                                                                                      | ES:                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                    |                                                                                                                                    |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| т/к                                                                                                                                                                                                                                                                  | P/bar                                                                                                                                                                                          | Mole fracti<br>in liquid,<br><sup>x</sup> Ne                                                                                                                                                                                                           | on of neon<br>in vapor,<br><sup>y</sup> Ne                                                                                                                                                                                         | т/к                                                                                                                                | P/bar                                                                                                                                                                                 | Mole fraction<br>in liquid,<br><sup>x</sup> Ne                                                                                                                                                                                     | on of neon<br>in vapor,<br><sup>Y</sup> Ne                                                                   |
| 65.97                                                                                                                                                                                                                                                                | 9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>89.1<br>107.9<br>117.7 | 0.0029<br>0.0058<br>0.0086<br>0.0114<br>0.0143<br>0.0169<br>0.0195<br>0.0219<br>0.0241<br>0.0261<br>0.0278<br>0.0294<br>0.0051<br>0.0079<br>0.0107<br>0.0136<br>0.0168<br>0.0198<br>0.0227<br>0.0257<br>0.0257<br>0.0257<br>0.0286<br>0.0316<br>0.0347 | 0.977<br>0.981<br>0.983<br>0.983<br>0.982<br>0.980<br>0.973<br>0.968<br>0.962<br>0.955<br>0.849<br>-<br>0.925<br>0.942<br>0.942<br>0.949<br>0.950<br>0.948<br>0.947<br>0.948<br>0.947<br>0.944<br>0.939<br>0.931<br>0.921<br>0.910 | 89.68                                                                                                                              | 9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>99.1<br>107.9 | 0.0018<br>0.0042<br>0.0075<br>0.0104<br>0.0135<br>0.0166<br>0.0198<br>0.0231<br>0.0268<br>0.0306<br>0.0344<br>0.0381<br>0.0004<br>0.0032<br>0.0061<br>0.0091<br>0.0122<br>0.0156<br>0.0191<br>0.0228<br>0.0271<br>0.0319<br>0.0374 | 0.775<br>0.823<br>0.849<br>0.857<br>0.858<br>0.858<br>0.858<br>0.856<br>0.854<br>0.847<br>0.837<br>0.823<br> |
| AUXILIARY INFORMATION                                                                                                                                                                                                                                                |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    |                                                                                                                                    |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS:                                                                                                                                                                                                          |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    |                                                                                                                                    |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
| Rocking autoclave partially filled<br>with liquid and then pressurized with<br>gas. Samples of phases analysed by<br>interferometry. Temperature measured<br>with platinum resistance thermometer<br>and pressure measured with Bourdon<br>gauge. Details in source. |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | <ol> <li>High purity sample, purity 99.7<br/>mole per cent.</li> <li>High purity sample, purity 99.9<br/>mole per cent.</li> </ol> |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    |                                                                                                                                    |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | $\delta T/K = \pm 0.01;  \delta P/bar = \pm 0.4;$<br>$\delta x_{Ne} = \delta y_{Ne} = \pm 0.0002.$                                 |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | REFERENCES:                                                                                                                        |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |
|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    |                                                                                                                                    |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                              |

COMPONENTS: ORIGINAL MEASUREMENTS: (1)Neon; Ne; 7440-01-9 Streett, W. B., Cryogenics, 1965, 5, (2) Nitrogen; N<sub>2</sub>; 7727-37-9 27. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of neon Mole fraction of neon T/K P/bar т/к in vapor, P/bar in liquid, in vapor, in liquid,  $x_{Ne}$  $^{y}$ Ne <sup>y</sup>Ne x<sub>Ne</sub> 66.13 3.90 0.9362 86.19 6.55 0.0116 0.5733 6.93 0.0198 0.9634 10.72 0.0242 0.7205 13.24 0.0387 0.9769 13.89 0.0334 20.82 0.0614 0.9810 14.27 0.0337 0.7810 20.44 27.37 0.0828 0.9828 0.0512 0.8319 34.58 0.1031 0.9820 28.34 0.0746 0.8628 0.1236 41.33 0.9825 0.8753 34.47 0.0937 48.16 0.1428 0.9816 41.51 0.1142 0.8852 55.26 0.9804 48.06 0.8897 0.1617 0.1338 62.40 0.1811 0.9780 55.57 0.1559 0.8928 69.98 0.2011 0.9749 62.40 0.1776 0.8930 77.50 5.48 0.0125 0.7738 71.02 0.2027 0.8912 8.41 0.0213 0.8592 90.65 9.31 0.0155 0.5431 12.34 0.0325 0.8951 15.17 0.0326 0.6929 0.0333 12.65 0.8978 21.13 0.0503 0.7597 16.55 0.0444 0.9142 28.54 0.0722 0.8017 20.68 0.0576 0.9271 35.09 0.0921 0.8231 27.85 0.0782 0.9386 41.37 0.1112 0.8358 34.44 0.0978 0.9428 48.61 0.1330 0.8450 41.58 0.1187 0.9460 55.40 0.1548 0.8502 48.33 0.1288 0.9464 62.50 0.1772 0.8514 55.40 0.1591 0.9456 69.46 0.2000 0.8512 62.05 0.1793 0.9444 100.78 21.93 0.0406 0.5291 0.9418 69.22 0.1991 30.58 0.6186 0.0674 86.19 4.48 0.0055 0.3957 43.78 0.1110 0.6878 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus No details given. with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.01$  except at 66.13K;  $\delta T/K =$  $\pm 0.02$  at 66.13K;  $\delta P/bar = \pm 0.01$ ;  $\delta x_{\rm Ne} = \pm 0.0002$  to 0.0004; δ<sup>y</sup>Ne ±0.002. **REFERENCES:**
|             |                                                             |                                                                    |                                                          | i                      |                                                    |                                                          |                                                |  |
|-------------|-------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------|------------------------|----------------------------------------------------|----------------------------------------------------------|------------------------------------------------|--|
| COMPONENTS: |                                                             |                                                                    |                                                          | ORIGINAL MEASUREMENTS: |                                                    |                                                          |                                                |  |
| (1) N       | (1) Neon; Ne; 7440-01-9                                     |                                                                    |                                                          |                        | Streett, W. B., Cryogenics, 1965, 5,               |                                                          |                                                |  |
| (2) N       | ) Nitrogen; N <sub>2</sub> ; 7727-37-9                      |                                                                    |                                                          | 27.                    |                                                    |                                                          |                                                |  |
|             |                                                             |                                                                    |                                                          |                        |                                                    |                                                          |                                                |  |
| EXPERIM     | ENTAL V                                                     | ALUES:                                                             |                                                          |                        |                                                    |                                                          |                                                |  |
| т/к         | P/bar                                                       | Mole fraction<br>in liquid,<br><sup>x</sup> Ne                     | on of neon<br>in vapor,<br><sup>y</sup> Ne               | т/К                    | P/bar                                              | Mole fracti<br>in liquid,<br><sup>x</sup> Ne             | on of neon<br>in vapor,<br><sup>Y</sup> Ne     |  |
| 100.78      | 53.71<br>63.30                                              | 0.1439<br>0.1768                                                   | 0.7100<br>0.7217                                         | 114.34<br>117.61       | 67.71<br>28.27                                     | 0.2055<br>0.0218                                         | 0.4227<br>0.1242                               |  |
| 103.91      | 68.71<br>24.13<br>32.96<br>40.33<br>47 44                   | 0.1975<br>0.0330<br>0.0619<br>0.0884<br>0.1105                     | 0.7207<br>0.3153<br>0.4338<br>0.4892<br>0.5242           |                        | 35.06<br>41.99<br>48.13<br>58.47<br>61.02          | 0.0483<br>0.0776<br>0.1055<br>0.1622<br>0.1755           | 0.2156<br>0.2766<br>0.3086<br>0.3294<br>0.3269 |  |
| 114.34      | 52.92<br>69.57<br>22.58<br>28.96<br>33.75<br>43.60<br>54.95 | 0.1512<br>0.2033<br>0.0134<br>0.0354<br>0.0528<br>0.0914<br>0.1394 | 0.5538<br>0.5630<br>0.1123<br>0.2313<br>0.2930<br>0.3747 | 120.64                 | 63.09<br>66.88<br>32.44<br>39.68<br>46.54<br>53.30 | 0.1962<br>0.2655<br>0.0257<br>0.0578<br>0.0987<br>0.1448 | 0.2703<br>0.1016<br>0.1748<br>0.2073<br>0.2138 |  |
|             |                                                             |                                                                    |                                                          |                        |                                                    | ·                                                        |                                                |  |

| COMPONENTS: |                                    | EVALUATOR:                |
|-------------|------------------------------------|---------------------------|
| 1.          | Neon; Ne; 7440-01-9                | Colin Young,              |
|             |                                    | School of Chemistry,      |
| 2.          | Oxygen; 0 <sub>2</sub> ; 7782-44-7 | University of Melbourne,  |
|             |                                    | Parkville, Victoria 3052, |
|             |                                    | AUSTRALIA.                |

## CRITICAL EVALUATION:

This system has been studied by Streett and Jones (1) and Skripka and coworkers (2,3). The study by Skripka and Dykhno (2) was over a limited range of pressure (up to 25 bar) and is probably of lower accuracy than the more recent work by Skripka and Lobonova (3). The data of Skripka and Lobonova (3) are only in fair agreement with the data of Streett and Jones (1). The solubility of neon reported by Skripka and Lobonova is generally greater than that reported by Jones and Streett (1) except at pressures below 50 bar where the opposite is usually true. Therefore the data of both Streett and Jones (1) and Skripka and Lobonova (3) are classified as tentative and that of Skripka and Dykhno (2) as doubtful.

## References

- 1. Streett, W. B. and Jones, C. H., Adv. Cryog. Engng., 1965, 11, 356.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., 1964, no. 8, 163.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no. 13, 90.

| COMPONENTS:                                                                                                                                                                                                                                                    | ORIGINAL MEASUREMENTS:                                                                                                                                                                                    |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <pre>(1) Neon; Ne; 7440-01-9 (2) Oxygen; O<sub>2</sub>; 7782-44-7</pre>                                                                                                                                                                                        | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinostr., <u>1964</u> , 8, 163.                                                                                          |  |  |  |  |
|                                                                                                                                                                                                                                                                |                                                                                                                                                                                                           |  |  |  |  |
| VARIABLES:                                                                                                                                                                                                                                                     | PREPARED BY:                                                                                                                                                                                              |  |  |  |  |
| Temperature, pressure                                                                                                                                                                                                                                          | C. L. Young                                                                                                                                                                                               |  |  |  |  |
| EXPERIMENTAL VALUES:                                                                                                                                                                                                                                           | Mole fraction of neon                                                                                                                                                                                     |  |  |  |  |
| T/K P/bar P <sup>+</sup> /bar                                                                                                                                                                                                                                  | in liquid, $x_{Ne}$ in vapor, $y_{Ne}$                                                                                                                                                                    |  |  |  |  |
| 67.0 6.06 6.02<br>11.11 11.06                                                                                                                                                                                                                                  | 0.00398 0.9940<br>0.00744 0.9961<br>0.01088 0.9966                                                                                                                                                        |  |  |  |  |
| 21.21 21.17                                                                                                                                                                                                                                                    | 0.01403 0.9967                                                                                                                                                                                            |  |  |  |  |
| 26.16 26.12<br>72.0 6.06 5.88                                                                                                                                                                                                                                  | 0.01741 0.9968<br>0.0041 0.9837                                                                                                                                                                           |  |  |  |  |
| 11.12 11.03                                                                                                                                                                                                                                                    | 0.0078 0.9898                                                                                                                                                                                             |  |  |  |  |
| 16.18 $16.1021.25$ $21.17$                                                                                                                                                                                                                                     | 0.0112 0.9919<br>0.0146 0.9927                                                                                                                                                                            |  |  |  |  |
| 26.26 26.18                                                                                                                                                                                                                                                    | 0.0183 0.9932                                                                                                                                                                                             |  |  |  |  |
| 11.08 10.85                                                                                                                                                                                                                                                    | 0.0042 0.9606<br>0.0080 0.9755                                                                                                                                                                            |  |  |  |  |
| 16.18 15.95                                                                                                                                                                                                                                                    | 0.0115 0.9814                                                                                                                                                                                             |  |  |  |  |
| 26.34 26.11                                                                                                                                                                                                                                                    | 0.0194 0.9858                                                                                                                                                                                             |  |  |  |  |
| 84.0 6.07 5.54                                                                                                                                                                                                                                                 | 0.0044 0.9041                                                                                                                                                                                             |  |  |  |  |
| 16.12 15.59                                                                                                                                                                                                                                                    | 0.0128 0.9611                                                                                                                                                                                             |  |  |  |  |
| 21.24 20.71<br>26.25 25.73                                                                                                                                                                                                                                     |                                                                                                                                                                                                           |  |  |  |  |
| 90.2 6.07 5.01                                                                                                                                                                                                                                                 | 0.0046 0.8045                                                                                                                                                                                             |  |  |  |  |
| 11.11 10.04<br>16.18 15.12                                                                                                                                                                                                                                     | 0.0092 0.8881<br>0.0140 0.9198                                                                                                                                                                            |  |  |  |  |
| 21.21 20.14                                                                                                                                                                                                                                                    | 0.0183 0.9348                                                                                                                                                                                             |  |  |  |  |
| 20.35 25.29                                                                                                                                                                                                                                                    | 0.0226 0.9431                                                                                                                                                                                             |  |  |  |  |
| r partial pressure of neon                                                                                                                                                                                                                                     |                                                                                                                                                                                                           |  |  |  |  |
| AUXILIARY                                                                                                                                                                                                                                                      | INFORMATION                                                                                                                                                                                               |  |  |  |  |
| METHOD/APPARATUS/PROCEDURE:                                                                                                                                                                                                                                    | SOURCE AND PURITY OF MATERIALS;                                                                                                                                                                           |  |  |  |  |
| Vapor flow apparatus with magnetic<br>recirculating pump. Temperature<br>measured with platinum resistance<br>thermometer, pressure measured with<br>Bourdon gauge. Samples of gas and<br>liquid analysed by gas phase inter-<br>ferometry. Details in source. | <ol> <li>High purity sample, purity<br/>99.69 mole per cent;<br/>impurities helium and nitrogen.</li> <li>Purity 99.5 mole per cent or<br/>better; major impurities<br/>argon and water vapor.</li> </ol> |  |  |  |  |
|                                                                                                                                                                                                                                                                |                                                                                                                                                                                                           |  |  |  |  |
|                                                                                                                                                                                                                                                                | $\delta T/K = \pm 0.02 \text{ to } 0.03;  \delta P \text{ less than} \\ 0.2 \text{ bar; } \delta x_{\text{Ne}} \approx \delta y_{\text{Ne}} = \pm 0.0001 \text{ to} \\ 0.0002.$                           |  |  |  |  |
|                                                                                                                                                                                                                                                                | REFERENCES :                                                                                                                                                                                              |  |  |  |  |

| COMPONENTS:                            |                                       |                              |                   | ORIGINAL MEASUREMENTS:           |                                            |                                       |                      |  |
|----------------------------------------|---------------------------------------|------------------------------|-------------------|----------------------------------|--------------------------------------------|---------------------------------------|----------------------|--|
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
| (1) Neon; Ne; 7440-01-9                |                                       |                              |                   | Streett, W. B. and Jones, C. H., |                                            |                                       |                      |  |
| (2) Oxygen; O <sub>2</sub> ; 7782-44-7 |                                       |                              |                   | Adv. C                           | Adv. Cryog. Engng., <u>1965</u> , 11, 356. |                                       |                      |  |
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
| _=                                     | · · · · · · · · · · · · · · · · · · · |                              |                   |                                  |                                            | ·······                               |                      |  |
| VARIABL                                | ES:                                   |                              |                   | PREPARED                         | BY:                                        |                                       |                      |  |
| Temper                                 | rature, p                             | pressure                     |                   | C. L.                            | Young                                      |                                       |                      |  |
| EVDEDTM                                |                                       |                              |                   |                                  | · · · · · ·                                | · · · · · · · · · · · · · · · · · · · |                      |  |
| EXPERIN                                | ENIAL VALU                            | Mole fractio                 | n of neon         |                                  |                                            | Mole fractio                          | on of neon           |  |
| т/к                                    | <i>P/</i> bar                         | in liquid,                   | in vapor,         | т/к                              | P/bar                                      | in liquid,                            | in vapor,            |  |
|                                        |                                       | "Ne                          | <sup>y</sup> Ne   |                                  |                                            | <sup>x</sup> Ne                       | <sup>y</sup> Ne      |  |
| 63.35                                  | 2.76                                  | 0.0016                       | 0.9947            | 89.44                            | 2.76                                       | 0.0015                                | 0.6404               |  |
|                                        | 13.76                                 | 0.0078                       | 0.9987            |                                  | 13.98                                      | 0.0119                                | 0.9183               |  |
|                                        | 20.82                                 | 0.0137                       | 0.9987            |                                  | 20.79                                      | 0.0178                                | 0.9391               |  |
|                                        | 27.30                                 | 0.0154                       | 0.9988            |                                  | 27.68                                      | 0.0241                                | 0.9494               |  |
|                                        | 34.44                                 | 0.0212                       | 0.9990            |                                  | 45.02                                      | 0.0298                                | 0.9547               |  |
|                                        | 47.61                                 | 0.0278                       | 0.9985            |                                  | 61.36                                      | 0.0501                                | 0.9634               |  |
|                                        | 54.61                                 | 0.0295                       | 0.9984            | 89.17                            | 107.2                                      | 0.0877                                | 0.9601               |  |
| 77 60                                  | 62.95                                 | 0.0334                       | 0.9977            |                                  | 140.0                                      | 0.1096                                | 0.9540               |  |
| 11.09                                  | 5.45                                  | 0.0029                       | 0.9652            |                                  | 207.8                                      | 0.1499                                | 0.9461               |  |
|                                        | 13.72                                 | 0.0109                       | 0.9802            |                                  | 243.4                                      | 0.1686                                | 0.9262               |  |
|                                        | 20.68                                 | 0.0160                       | 0.9843            |                                  | 274.1                                      | 0.1841                                | 0.9177               |  |
|                                        | 27.51                                 | 0.0216                       | 0.9865            |                                  | 307.9                                      | 0.1998                                | 0.9083               |  |
|                                        | 34.00                                 | 0.0255                       | 0.9864            | 101.46                           | 2,92                                       | 0.0000                                | 0.0000               |  |
|                                        | 42.89                                 | 0.0321                       | 0.9878            |                                  | 4.34                                       | 0.0015                                | 0.3098               |  |
|                                        | 54.88                                 | 0.0491                       | 0.9866            |                                  | 7.76                                       | 0.0050                                | 0.6010               |  |
|                                        | 69.50                                 | 0.0668                       | 0.9852            |                                  | 13.27                                      | 0.0109                                | 0.7493               |  |
|                                        | 138.9                                 | 0.1046                       | 0.9788            |                                  | 27.75                                      | 0.0256                                | 0.8594               |  |
|                                        | 206.5                                 | 0.1228                       | 0.9671            |                                  | 34.78                                      | 0.0322                                | 0.8789               |  |
|                                        | 278.5<br>343.7                        | 0.1359                       | 0.9562            |                                  | 41.71                                      | 0.0386                                | 0.8910<br>0.8994     |  |
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
|                                        |                                       |                              | AUXILIARY         | INFORMAT                         | ION                                        |                                       |                      |  |
| METHOD                                 | APPARATU                              | IS/PROCEDURE:                |                   | SOURCE A                         | ND PURITY                                  | OF MATERIALS:                         |                      |  |
| Recirc                                 | ulating                               | vapor flow a                 | pparatus          |                                  | No det                                     | ails given.                           |                      |  |
| with m                                 | agnetic<br>re Sa                      | pump at ampi<br>moles analys | ent tem-<br>ed by |                                  |                                            | -                                     |                      |  |
| therma                                 | al conduc                             | tivity. T                    | emperature        |                                  |                                            |                                       |                      |  |
| measur                                 | ed with                               | platinum res                 | istance           |                                  |                                            |                                       |                      |  |
| thermo                                 | meter.                                | Pressure me                  | asured            |                                  |                                            |                                       |                      |  |
| using                                  | Bourdon                               | gauge. Det                   | ails in           |                                  |                                            |                                       |                      |  |
| 161. 1                                 | •                                     |                              |                   |                                  |                                            |                                       |                      |  |
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
|                                        |                                       |                              |                   | FOTTMAT                          |                                            |                                       |                      |  |
|                                        |                                       |                              |                   | $\delta T/K =$                   | ±0.01;                                     | $\delta P/bar = \pm 0$                | .l (up to            |  |
|                                        |                                       |                              |                   | 100 ba                           | $r) = \pm 0$ .                             | 7 (above 100                          | ) bar);              |  |
|                                        |                                       |                              |                   | $\delta x_{\rm Ne} =$            | ±0.001                                     | to ±0.0002;                           | öy <sub>Ne</sub> =   |  |
|                                        |                                       |                              |                   | ±0.001                           | to ±0.0                                    | 002.                                  |                      |  |
|                                        |                                       |                              |                   | REFEREN                          | CES:                                       |                                       |                      |  |
|                                        |                                       |                              |                   | 1. St                            | reett, W                                   | I. B., Cryoge                         | enics, <u>1</u> 965, |  |
|                                        |                                       |                              |                   | 5.                               | 27.                                        |                                       |                      |  |
|                                        |                                       |                              |                   | .,                               | -                                          |                                       |                      |  |
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
|                                        |                                       |                              |                   |                                  |                                            |                                       |                      |  |
| L                                      |                                       |                              |                   |                                  |                                            |                                       |                      |  |

|             |                |                            |                  | ·                                                                    |                | ·                        |                         |
|-------------|----------------|----------------------------|------------------|----------------------------------------------------------------------|----------------|--------------------------|-------------------------|
| COMPONENTS: |                |                            |                  | ORIGINAL MEASUREMENTS:                                               |                |                          |                         |
| (1) Ne      | eon; Ne;       | 7440-01-9                  |                  | Streett, W. B. and Jones, C. H.,<br>Adv. Cruog. Engage 1965, 11, 356 |                |                          |                         |
| (2) 02      | kygen; O       | 2; 7782-44-7               |                  |                                                                      | 1909. 2        |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
| EXPERIM     | ENTAL VI       | ALUES:                     | -                |                                                                      |                |                          | -                       |
| т/к         | P/bar          | Mole fractic<br>in liquid, | in vapor,        | т/к                                                                  | P/bar          | Mole fraction in liquid, | on of neon<br>in vapor, |
|             |                | <sup>x</sup> Ne            | <sup>y</sup> Ne  |                                                                      |                | <sup>x</sup> Ne          | <sup>y</sup> ne         |
| 101.46      | 55.43          | 0.0538                     | 0.9050           | 102.03                                                               | 28.75          | 0.0238                   | 0.5531                  |
|             | 68.81          | 0.0678                     | 0.9105           |                                                                      | 42.37          | 0.0415                   | 0.6549                  |
|             | 104.8          | 0.1038                     | 0.9133<br>0.9060 |                                                                      | 49.47          | 0.0510                   | 0.6845                  |
|             | 183.4          | 0.1801                     | 0.8916           |                                                                      | 64.19          | 0.0703                   | 0.7249                  |
|             | 207.9          | 0.2037                     | 0.8793           |                                                                      | 69.50<br>90.87 | 0.0785                   | 0.7338                  |
|             | 282.0          | 0.2756                     | 0.8374           |                                                                      | 108.9          | 0.1359                   | 0.7611                  |
|             | 312.3          | 0.3095                     | 0.8158           |                                                                      | 140.3          | 0.1850                   | 0.7552                  |
| 110.39      | 5.76           | 0.0000                     | 0.0000           |                                                                      | 209.6          | 0.3358                   | 0.6659                  |
|             | 6.65           | 0.0012                     | 0.1447           | 120.00                                                               | 227.9          | 0.4099                   | 0.6024                  |
|             | 14.10          | 0.0163                     | 0.6619           | 130.00                                                               | 32.58          | 0.0200                   | 0.3520                  |
|             | 27.03          | 0.0240                     | 0.7334           |                                                                      | 37.82          | 0.0288                   | 0.4128                  |
|             | 35.44<br>41.92 | 0.0324                     | 0.8022           |                                                                      | 44.47<br>52.37 | 0.0395                   | 0.4692                  |
|             | 55.74          | 0.0558                     | 0.8296           |                                                                      | 57.00          | 0.0539                   | 0.5376                  |
|             | 65.83<br>69.64 | 0.0699                     | 0.8404           |                                                                      | 64.74<br>83.29 | 0.0708                   | 0.5648                  |
|             | 108.8          | 0.1210                     | 0.8544           |                                                                      | 107.6          | 0.1502                   | 0.6227                  |
|             | 140.0          | 0.1594                     | 0.8484           |                                                                      | 140.4          | 0.2269                   | 0.6064                  |
|             | 209.5          | 0.2522                     | 0.8084           |                                                                      | 170.3          | 0.3402                   | 0.5165                  |
|             | 245.0<br>279 0 | 0.3088                     | 0.7730           | 146.36                                                               | 44.33          | 0.0195                   | 0.1190                  |
|             | 307.5          | 0.4931                     | 0.6420           |                                                                      | 89.49          | 0.1406                   | 0.2949                  |
| 120.03      | 10.31          | 0.0000                     | 0.0000           | 150 00                                                               | 93.08          | 0.1622                   | 0.2830                  |
|             | 12.10          | 0.0023                     | 0.1252           | 152.29                                                               | 50.88          | 0.0147                   | 0.0434<br>0.0752        |
|             | 21.48          | 0.0144                     | 0.4454           |                                                                      |                | 0.0002                   | 00002                   |
|             |                | <u></u>                    | <del></del>      |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |
|             |                |                            |                  |                                                                      |                |                          |                         |

|                 |                    |                               |                          | ·                                   |                             |                               |                         |  |
|-----------------|--------------------|-------------------------------|--------------------------|-------------------------------------|-----------------------------|-------------------------------|-------------------------|--|
| COMPONENTS:     |                    |                               |                          | ORIGINAL MEASUREMENTS:              |                             |                               |                         |  |
| (l) Ne          | eon; Ne            | ; 7440-01-9                   |                          | Skripka, V. G. and Lobonova, N. N., |                             |                               |                         |  |
| (2) Ox          | kygen;             | 02; 7782-44-                  | 7                        | Trudy Vses. NauchIssled. Inst.      |                             |                               |                         |  |
|                 |                    |                               |                          | Kriog.                              | Mashino                     | str., <u>1971</u> ,           | 13, 90.                 |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
| VARIABLE        | S:                 |                               |                          | PREPARED                            | BY:                         |                               |                         |  |
| Tempera         | ture, p            | ressure                       |                          | с. г.                               | Young                       |                               |                         |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
| EXPERIMEN       | NTAL VALU          | ES:                           |                          |                                     |                             |                               |                         |  |
| т/к             | <i>P/</i> bar      | Mole fractio                  | on of neon<br>in vapor.  | т/к                                 | <i>P/</i> bar               | Mole fracti<br>in liquid.     | on of neon<br>in vapor. |  |
| -,              | ,                  | <sup>x</sup> Ne               | <sup>y</sup> Ne          | -,                                  | ,                           | <sup>x</sup> Ne               | <sup>y</sup> Ne         |  |
| 64.14           | 9.8                | 0.0035                        |                          | 77.81                               | 49.0                        | 0.0340                        | 0.9815                  |  |
|                 | 19.6               | 0.0072                        | 0.9950                   | -                                   | 58.8                        | 0.0410                        | 0.9815                  |  |
|                 | 39.2               | 0.0120                        | 0.9955                   |                                     | 78.5                        | 0.0485                        | 0.9790                  |  |
|                 | 49.0               | 0.0220                        | 0.9950                   |                                     | 88.3                        | 0.0640                        | 0.9770                  |  |
|                 | 58.8               | 0.0280                        | 0.9950                   |                                     | 107.9                       | 0.0770                        | 0.9730                  |  |
|                 | 78.5               | 0.0390                        | 0.9930                   |                                     | 117.7                       | 0.0820                        | 0.9710                  |  |
|                 | 88.3<br>98.1       | 0.0440                        | 0.9915                   |                                     | 129.5                       | 0.0880                        | 0.9690                  |  |
|                 | 107.9              | 0.0500                        | 0.9875                   |                                     | 147.1                       | 0.0985                        | 0.9650                  |  |
|                 | 117.7              | 0.0530                        | 0.9860                   |                                     | 156.9                       | 0.1030                        | 0.9630                  |  |
|                 | 137.3              | 0.0590                        | 0.9820                   |                                     | 176.5                       | 0.1125                        | 0.9590                  |  |
|                 | 147.1              | 0.0620                        | 0.9800                   |                                     | 186.3                       | 0.1170                        | 0.9570                  |  |
|                 | 166.7              | 0.0690                        | 0.9750                   |                                     | 205.9                       | 0.1240                        | -                       |  |
|                 | 176.5              | 0.0720                        | 0.9720                   | 90.73                               | 9.8                         | 0.0080                        | -                       |  |
|                 | 196.1              | 0.0790                        | 0.9630                   |                                     | 29.4                        | 0.0240                        | 0.9295                  |  |
| 77 01           | 205.9              | 0.0825                        | -                        |                                     | 39.2                        | 0.0330                        | 0.9305                  |  |
| //.01           | 19.6               | 0.0130                        | _                        |                                     | 58.8                        | 0.0550                        | 0.9375                  |  |
|                 | 29.4<br>39.2       | 0.0200<br>0.0270              | 0.9780<br>0.9790         |                                     | 68.6<br>78.5                | 0.0665                        | 0.9380<br>0.9380        |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
|                 |                    | - /                           | AUXILIARI                |                                     | ND DUDITY                   | OF MATERIALC.                 |                         |  |
| METHOD/A        | PPARATU            | S/PROCEDURE:                  | f;11.d                   | SOURCE #                            | AND PURITY                  | OF MAIERIALS;                 | umitu 00 7              |  |
| with li         | quid and           | d then pressu                 | rized with               | mole per cent.                      |                             |                               |                         |  |
| gas.<br>interfe | Samples<br>rometry | of phases an<br>. Temperatu   | alysed by<br>re measured | 2. Hid                              | h purit                     | v sample; p                   | urity 99.8              |  |
| with pl         | atinum             | resistance th                 | ermometer                | mo                                  | le per ce                   | ent.                          |                         |  |
| and pre         | ssure me<br>Detai  | easured with<br>ls in source. | Bourdon                  |                                     |                             |                               |                         |  |
| 55-0            |                    |                               |                          |                                     |                             |                               |                         |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
|                 |                    |                               |                          | ESTIMAT                             | ED ERROR:                   |                               |                         |  |
|                 |                    |                               |                          | δТ/К =                              | ±0.01;                      | $\delta P/\text{bar} = \pm 0$ | .4;                     |  |
|                 |                    |                               |                          | <sup>δx</sup> Ne'                   | $\delta y_{\rm Ne} = \pm 0$ | 0.002.                        |                         |  |
|                 |                    |                               |                          | REFEREN                             | CES:                        |                               |                         |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
| 1               |                    |                               |                          |                                     |                             |                               |                         |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
|                 |                    |                               |                          |                                     |                             |                               |                         |  |
| l               |                    |                               |                          | 1                                   |                             |                               |                         |  |

| COMPONENTS: |                         |                            | ORIGINAL MEASUREMENTS: |                                                                       |                |                 |                 |  |
|-------------|-------------------------|----------------------------|------------------------|-----------------------------------------------------------------------|----------------|-----------------|-----------------|--|
| (1) N       | (1) Neon; Ne; 7440-01-9 |                            |                        | Skripka, V. G. and Lobonova, N. N.,<br>Trudy Vses. NauchIssled. Inst. |                |                 |                 |  |
| (2) 0       | xygen;                  | 0 <sub>2</sub> ; 7782-44-7 | 1                      | Kriog. Mashinostr., <u>1971</u> , 13, 90                              |                |                 |                 |  |
|             |                         |                            |                        |                                                                       |                |                 |                 |  |
| EXPERIM     | IENTAL V                | ALUES:                     |                        |                                                                       |                |                 |                 |  |
| m /12       |                         | Mole fractio               | on of neon             | m /12                                                                 | Dham           | Mole fractio    | on of neon      |  |
| 17K         | PJDdr                   | <sup>x</sup> Ne            | <sup>y</sup> Ne        | 1/K                                                                   | r <b>y</b> bai | <sup>x</sup> Ne | <sup>y</sup> Ne |  |
| 90.73       | 88.3                    | 0.0895                     | 0.9370                 | 103.0                                                                 | 147.1          | 0.1800          | 0.8645          |  |
|             | 99.1<br>107.9           | 0.1100                     | 0.9355                 |                                                                       | 156.9          | 0.1925          | 0.8595          |  |
|             | 117.7                   | 0.1200                     | 0.9310                 |                                                                       | 176.5          | 0.2190          | 0.8470          |  |
|             | 129.5                   | 0.1300                     | 0.9290                 | 118.65                                                                | 196.1          | 0.2335          | 0.8370          |  |
|             | 147.1                   | 0.1510                     | 0.9220                 |                                                                       | 205.9          | 0.2640          | 0.8120          |  |
|             | 156.9                   | 0.1625                     | 0.9180                 |                                                                       | 9.8            | 0.0005          | -               |  |
|             | 176.5                   | 0.1790                     | 0.9090                 |                                                                       | 29.4           | 0.0250          | -               |  |
|             | 186.3                   | 0.1885                     | 0.9035                 |                                                                       | 39.2           | 0.0375          | 0.5990          |  |
|             | 196.1<br>205 9          | 0.1980                     | 0.8970                 |                                                                       | 49.0<br>58.8   | 0.0510          | 0.6275          |  |
| 103.9       | 9.8                     | 0.0070                     | -                      |                                                                       | 68.6           | 0.0810          | 0.6755          |  |
|             | 19.6                    | 0.0180                     | -                      |                                                                       | 78.5           | 0.0980          | 0.6940          |  |
|             | 29.4                    | 0.0290                     | 0.8080                 |                                                                       | 88.3<br>98.1   | 0.1165          | 0.7075          |  |
|             | 49.0                    | 0.0520                     | 0.8520                 |                                                                       | 107.9          | 0.1525          | 0.7170          |  |
|             | 58.8                    | 0.0655                     | 0.8650                 |                                                                       | 117.7          | 0.1710          | 0.7155          |  |
|             | 68.6                    | 0.0760                     | 0.8725                 |                                                                       | 129.5          | 0.1895          | 0.7115          |  |
|             | 88.3                    | 0.1030                     | 0.8765                 |                                                                       | 147.1          | 0.2320          | 0.6950          |  |
|             | 98.1                    | 0.1160                     | 0.8760                 |                                                                       | 156.9          | 0.2570          | 0.6820          |  |
|             | 107.9                   | 0.1290                     | 0.8755                 |                                                                       | 166.7          | 0.2850          | 0.6645          |  |
|             | 129 5                   | 0.1420                     | 0.8740                 |                                                                       | 186 3          | 0.3185          | 0.6415          |  |
|             | 137.3                   | 0.1675                     | 0.8685                 |                                                                       | 100.0          | 0.5475          |                 |  |
|             |                         |                            |                        |                                                                       |                |                 |                 |  |
|             |                         |                            |                        |                                                                       |                |                 |                 |  |
| !           |                         |                            |                        |                                                                       |                |                 |                 |  |

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Underlined page numbers refer to the start of the evaluation text and those not underlined to the start of the compiled tables for that system. The compounds are listed in the order as in the Chemical Abstract indexes, for example toluene is listed as benzene, methyl- and dimethylsulfoxide is listed as methane, sulfinylbis-.

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