of substance (Stoffmenge, in German) of a system that contains as many elementary entities as there are carbon atoms in 0.012 kg of carbon. We do not do students a service if we teach them fundamental ideas that later must be unlearned or relearned. On page 65 one learns that "the NaOH has only one OH^- ion per mole." What is meant, of course, is that there is one mole of OH^- ions per mole of NaOH. Stoichiometry is an essential component of any beginning chemistry course and a clear understanding of the concepts atomic weight or relative mass of an atom, molecular weight or relative mass of a molecule, atomic mass, molecular mass, and mole is crucial for further study and for success in solving problems.

The examples given are serious shortcomings in a book whose preface claims that "experience shows that the student who masters the material in this little book goes into college chemistry without serious deficiencies." Given the purpose of the book, basic concepts must be stated clearly and in an impeccably correct manner, and this the authors have failed to do. I do not see any useful purpose that could be served by this text and I cannot recommend it.

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Introduction to Physical Chemistry

Arthur M. Lesk, Prentice-Hall Inc., Englewood Cliffs, NJ, 1982. vii + 746 pp. Figs. and tables. 18 × 24 cm. $38.95 HB.

Here is a fine treatment of all the main topics of physical chemistry. The writing is clear, the illustrations are appropriate, and the problems are excellent. It would be a sensible choice as a text for use with well-prepared and motivated students. It suffers from some organizational peculiarities, occasional haziness regarding definitions, and a level of exposition which demands a level of physical insight which is unfortunately not common in undergraduates.

To elaborate on these remarks, consider first the really good things. Lesk shows a concern both for overall perspective and for attention to details. Throughout the book there is no mathematical pedantry, and there are many fine examples of clear explanation which do not allow the distance between theory and experiment to become very great. Among these are the chapters on applications of thermodynamics, statistical mechanics, solids, X-ray crystallography, the fluid state, and electrochemistry. Topics are treated thoroughly and amply illustrated by numerical examples, figures, and tables. The use of actual literature data in the latter as well as in many problems is to be commended. There are several places in the book where important compilations of data and bibliographies are presented; e.g., in chapters 1, 6, 14, and 17. No other physical chemistry text does as good a job in relating itself to the chemical literature. The book rewards close attention with numerous new ways of thinking about familiar topics.

This leads to some critical observations. Although the mathematical level is low, the conceptual level is not. Lesk argues his case convincingly and non-trivially, and I fear that frequently only mature students will be able to follow him. A case in point is the way in which such a large number of topics (e.g., solids, liquids, gases, phase transitions, thermodynamics, quantum mechanics, and statistical mechanics) are introduced in an overview of physical chemistry in chapters 2 and 3. As a book for graduate students *reviewing* the subject these chapters will be very helpful; as a first exposure to neophytes they will probably bewilder.

There are other problems with the organization. (1) If the statistical mechanics of ideal gases is treated before quantum mechanics, there are too many formulas for eigenvalues which must be pulled out of the hat. (2) A more serious matter concerns the division of thermodynamics into two blocks of material. After a conventional introduction to thermodynamics and some of its applications, there is an intrusion of eight chapters before thermodynamics is applied in chapters 15, 16, and 17 to real gases, binary solutions, and Galvanic cells, respectively. This will present a problem to those of us who prefer to treat thermodynamics and its applications before moving on to molecular phenomena because chapters 15, 16, and 17 utilize material from the intervening chapters and chapter 17 also contains non-thermodynamic topics; e.g., conductance.

Although the exposition is generally very clear, Lesk occasionally falters in defining basic quantities; e.g., although the First Law is clearly stated and expertly applied, I find the definitions of work, heat, and temperature to be somewhat vague.

At the beginning of each chapter "learning goals" are stated and a study guide is provided which gives a good summary of the chapter.

On balance, there is more good than bad here. I would expect the book to be most successful in situations where the majority of the students are highly motivated. If there were such a thing as a second-level course in physical chemistry, this would be a good text to use.

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Nuclear Magnetic Resonance Spectroscopy

Robin K. Harris, Pitman Publishing Inc., Marshfield, MA, 1983. xx + 250. Figs. and tables. 19 × 24. $34.95.

Robin K. Harris has written a physically oriented introductory NMR text directed toward the advanced undergraduate and beginning graduate student which should also prove useful for chemists who use NMR as a structural tool. The organization of this excellent book reflects the increased experimental emphasis on time domain NMR spectroscopy which has occurred over the last decade while retaining the principal features of an earlier text by the same author ("Nuclear Magnetic Resonance Spectroscopy" by R. Lynden-Bell and R. K. Harris, Thomas Nelson and Sons, Ltd., 1969).

Material is presented in eight largely self-containing chapters preceded by a complete symbol and abbreviation list which facilitates easy reference. Emphasis is on theoretical aspects with many practical applications discussed with the aid of figures and presented in accompanying problems. Each chapter contains excellent illustrations, useful tables, up-to-date specific and general references and problems of varying difficulty. The chapter sequence is somewhat arbitrary; for example, chemical shifts and coupling constants are discussed in the final chapter although this material logically follows topics covered in the introductory chapters.

Basic principles, spectral analysis of isotropic systems, chemical shifts and coupling constants are thoroughly covered at a level appropriate for the advanced undergraduate student who has some prior exposure to basic principles of quantum mechanics. The mathematical level is elementary and density matrix formalism is not utilized. For example, the chapter on analysis of complex spectra begins with a discussion of operator algebra and proceeds through the formulation and solution of spin matrices for complex coupled systems. Time-dependent perturbation theory and selection rules appear in an appendix.

Relaxation measurements and mechanisms, multiple-pulse experiments, double resonance, spin decoupling, the nuclear Overhauser effect, and Fourier transform techniques are discussed in detail in early chapters in the book. Time domain spectroscopy is emphasized not only for its signal enhancement capability but also for the structural and dynamical information multiple pulse sequence experiments can provide. The latter is an especially unique and important feature of the text. Spin echoes and selective pulse sequences are discussed with emphasis on INEPT experiments and heteronuclear and homonuclear 2D J-resolved spectroscopy.

A chapter combining material on chemical exchange and quadrupolar effects is also included and its coverage is greatly expanded from the earlier book. Topics include lineshapes for uncoupled equally populated site exchange, exchange rates from spin-lattice relaxation and saturation transfer, as well as exchange involving paramagnetic species. Effects of coupling of spin $\frac{1}{2}$ nuclei to quadrupolar nuclei are discussed.

The author has included a thorough and timely discussion of NMR of solids including magic angle rotation, a discussion of second moment effects, motional effects on relaxation time, cross polarization, shielding anisotropy, obtaining high resolution NMR spectra in the solid state including CP/MAR techniques. In contrast, applications of NMR spectroscopy to gases is completely omitted. Other areas not covered include biological applications, CIDNP, spin imaging and related topics.

Although this text would be most suitable for an undergraduate special topics course in NMR spectroscopy most chemistry departments in the U.S. do not provide such a course and a special strength of this book is its amenability to self-directed study. The author's style is concise and clear. The book's contents allow interested individuals to master the basic principles of NMR spectroscopy and gain an appreciation of the present capabilities of this powerful technique, and extensive references and a bibliography provide direction for further study in specific areas.

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