BOOK REVIEWS

Mass Spectrometry

Recent Topics in Mass Spectrometry. Edited by Rowland Ivor Reed. Pp. ix+357. (Gordon and Breach: New York, London and Paris, June 1971.) $29.40; £12.25.

THIS book consists of twelve articles based on lectures given at the NATO Study Institute of Mass Spectrometry in Lisbon in 1969. It aims to provide an introduction to physical principles, instrumentation, techniques and applications rather than to present a rationalization of fragmentation pathways within the framework developed by organic chemists. In general, each article stands on its own as a short account of some particular facet of mass spectrometry. Inevitably in a book of this type, it is difficult to ensure uniform coverage of the subject and the subject matter to some extent depends on the availability of lecturers. In this volume, both the lengths of the articles and the level at which they are presented are very variable, but most mass spectroscopists will find something to interest them in several of the articles.

Three closely related articles discuss the energetics of ion formation and fragmentation, the observation of metastable transitions, and a theoretical discussion of the energetics and mechanistic aspects of metastable transitions. The first two are fairly standard treatments suitable for newcomers to the subject, but the third is at a much higher level and seems somewhat out of place in a collection of introductory, descriptive articles. The application of wave-mechanics to a number of interesting problems is discussed, but the treatment is necessarily rather compressed.

Two chapters discuss the production of ions by methods other than electron impact. Collin describes the application of high resolution photoionization and photoelectron spectroscopy to small molecules and concludes with a short account of ESCA. The use of field ionization in the study of rearrangement processes is compared with results obtained using low energy electrons, with special reference to different types of McLafferty rearrangements. In an article on techniques used in GC/MS work, it is shown that by using direct coupling by means of a restrictor in conjunction with open columns and suitable carrier gas flow rates, problems associated with the use of separators can be avoided.

In two of the longer articles, applications in nuclear and reactor physics and in the petroleum and chemical industries are discussed. Each chapter is well illustrated and examples of instrumentation and data taken from many different fields are given, including isotope separation, quantitative analytical studies, process control and research applications.

A further two articles describe attempts to correlate mass spectral data. The general features of the mass spectra of different types of metallocenes are summarized together with correlations between ionization potentials and other parameters; this chapter also contains an extensive bibliography and tabulation of thermochemical data.

The second article is in the nature of a progress report on the application of set theory to the analysis of mass spectra produced by isomeric alkanes, alkenes and cycloalkanes. The two remaining articles are relatively brief accounts of factors affecting the stability of multiply charged ions of aromatic compounds and of the application of high resolution mass spectrometry to the analysis of complex mixtures found in air pollution studies in the coal industry.

The volume ends with a list of participants (surely unnecessary) and author, compound and subject indexes. The book is well produced and clearly printed, although the review copy had pages 113–128 duplicated. Its high price will probably mean that few individuals will feel able to afford it.

K. R. JENNINGS

Classical and Quantum

Molecular Thermodynamics. By J. H. Knox. Pp. xiii+264. (Wiley Interscience: London and New York, July 1971.) £4.25.

THIS book has many useful and pleasing features. The first part, entitled "Fundamentals", is a clear and well signposted introduction to the basic ideas of classical and quantum mechanics and of classical and statistical thermodynamics (the absence of Lagrangian multipliers will please many students of chemistry). The second part, entitled "Partition Functions and their Applications", contains chapters which describe methods of calculating partition functions, the statistical treatments of the ideal gas and the perfect crystal, the Maxwell-Boltzmann distribution law, chemical equilibrium, and the transition state theory of rate processes. The last chapter consists of a good bibliography. The style is easy to read, and the discussion is well illustrated by many sample calculations and good diagrams. Following the appropriate chapter is a set of problems to which solutions are given at the end of the book.

Unlike many similar texts which from an early stage use only the more familiar (to the average undergraduate in chemistry) quantum descriptions, this book, where possible, gives parallel treatments in quantum and classical language. The student reader is thus better prepared to tackle those more advanced topics in statistical mechanics, such as present-day theories of dense fluids, which use classical methods only. It is a pity perhaps that the term "phase integral" is nowhere mentioned. A serious omission is the lack, in an admittedly introductory text, of even a brief mention of such topics as imperfect gases, mixtures of substances, or adsorption, given that space is found for a discussion of no fewer than three applications of transition state theory with a detail rarely found even in standard texts on physical chemistry.

This book is intended for second and third year undergraduates in chemistry, presumably at Scottish universities because the gap mentioned earlier makes it unsuitable for final year students at most other British universities. In achieving this intention the book is largely successful, although the novice reader will not be helped by typographical errors such as $U=q+w$ (equation 3.1.1.), $\Delta px\Delta p=h$ (equation 2.3.1.), and $C_p=C_{vib}+\frac{7}{2}RT$ (page 165), nor by the occasional eccentric choice of symbol, for example, the operator d is used to denote both incremental and small quantities.

The book is otherwise well produced but it is expensive both for its size and intended buyer. I cannot recommend it to an undergraduate in preference to its most obvious competitor which is still fresh after twenty-three years in print, which covers twice as much ground, and which costs less than half the price.

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