

---

 NEW BOOKS
 

---

**How to Solve Problems in Qualitative Analysis.** By JOSEPH A. BABOR, Associate Professor of Chemistry, The College of the City of New York, and J. KENNETH W. MACALPINE, Assistant Professor of Chemistry, New York University. Thomas Y. Crowell Company, 432 Fourth Avenue, New York, N. Y., 1943. iv + 93 pp. 14 × 21 cm. Price, \$0.75.

The increasing importance of mathematical operations in chemistry has been producing a variety of "problem-solving" books, and this one is among the first dealing with qualitative analysis. Chapters composed of definitions, explanatory matter, examples and problems for the student, are presented under the titles: 1. Mathematical Operations, 2. Concentration of Solutions, 3. Weak Electrolytes, 4. Solubility-Product Principle, 5. Ionization Constant and Solubility Product, 6. The Water Equilibrium; Hydrolysis, 7. Complex Ions. The average sophomore student will have been exposed already to much of this material, but a lot of it will not have been retained. Diligent use of this condensed pamphlet will serve to revive and polish a student's faded comprehension into practically workable form.

ALLEN D. BLISS

**Proteins, Amino Acids and Peptides as Ions and Dipolar Ions.** By EDWIN J. COHN and JOHN T. EDSALL, Harvard Medical School. (A. C. S. Monograph Series.) Reinhold Publishing Corporation, 330 West Forty-second St., New York, N. Y., 1943. xviii + 686 pp. 15.5 × 235 cm. Price, \$13.50.

At the present time, the outstandingly important general problem in the chemistry of natural products is the determination of the structure of proteins. Through the work of Emil Fischer and his predecessors, it has long been recognized that proteins consist of complicated condensation products of amino acids linked by peptide bonds, but of the ordinal distribution of these component units, and the effects of fine structure upon physicochemical properties, our knowledge is almost entirely conjectural. This state of affairs is ascribable to the complexity of the problem rather than to any neglect, for during the past decades much effort has been devoted to its elucidation.

The appearance of this treatise, written by a group of investigators who themselves have added, by observation and interpretation, to our knowledge of the physicochemical behavior of proteins, is therefore particularly welcome. Chapters on special aspects of the subject have been contributed independently or in collaboration with one of the authors by John D. Ferry, John G. Kirkwood, John W. Mehl, Hans Mueller, L. J. Oncley, and George Scatchard. No attempt has been made to present a systematic discussion of protein chemistry in all its phases, nor to describe experimental procedures.

The first half of the book deals with amino acids and peptides, consideration of which is an essential preliminary to the theoretical treatment of proteins. In an introductory chapter, Cohn and Edsall survey the modern theoretical views of dipolar ions and indicate the application of these to proteins. The second chapter, by Edsall, consists of a discussion of spectroscopic properties of dipolar ions; mere mention is made of the author's elegant demonstration that Raman spectra afford cogent evidence, supported by infrared and ultraviolet spectra, of the dipolar character of amino acids. In Chapter 3, Scatchard applies concentrated thermodynamics and simple electrostatic theory to dipolar systems. Chapter 4, by Edsall, relating to acid-base equilibria, contains a lucid description of Brønsted's theory as applied to amino acids and discusses in detail the

ionization data of various types of amino acids and peptides; this discussion is continued in the fifth chapter, entitled *Some Relations between Acidity and Chemical Structure*, also by Edsall, who includes here a pertinent outline of the resonance theory. In Chapter 6, Edsall gives a comprehensive survey of work on the dielectric constants and dipole moments of dipolar ions; in Chapter 7 he discusses apparent molal volume, heat capacity, compressibility and surface tension of dipolar ions in solution. Chapter 8, by Edsall and Scatchard, relates to solubility in water and organic liquids, and includes a brief section on hydrogen bonding. Chapter 9, by Cohn and Edsall, treats of interactions between organic solvents and dipolar ions, as estimated from solubility ratios, in reference to the respective importance of the hydrophilic and hydrophobic groups in the amino acid molecule; the impressive volume of data permits the detection of striking quantitative trends in solubility relations. Chapter 10, by Cohn, is devoted to interactions between amino acids, peptides and related substances, and their effect on the activity coefficient. In Chapter 11, the same author considers the effect of interactions between ions and amino acids or peptides upon solubility, and discusses the theory of salting-out and salting-in. Chapter 12, by Kirkwood, is devoted to theoretical interpretation of the properties of solutions of dipolar ions which are characteristic of their electrical structure.

The second half of this volume bears the general title "The Size, Shape and Electric Charge of Protein Molecules." In Chapter 13, Edsall considers the structural basis of the protein molecule as inferred from analysis and from the action of proteolytic enzymes. Here the absence of clear-cut evidence of precise structure, in the organic chemist's sense of the word, combined with the inordinately complicated nature of the molecule, renders the author's task of summary difficult in the extreme; he has, however, so marshalled the pertinent facts as to present as clear a picture as seems humanly possible.

The succeeding chapters are devoted to more detailed discussion of restricted avenues of approach. In Chapter 14, Edsall considers the evidence concerning the peptide chain afforded by X-ray diffraction studies, discusses the structure of the "fibrous" and the "globular" proteins, gives a few paragraphs to the virus proteins, and concludes with brief sections on the cyclol hypothesis and on the deductions from Patterson projections. Chapter 15, by Cohn, consists of a survey of the natural amino acids, the special methods by which some of these are estimated in protein hydrolysates, and the amino acid composition of a few proteins. Chapter 16, by Cohn and Edsall, deals with the density of proteins and the molal volumes of their constituent amino acid residues. The osmotic pressure of proteins in solution and the deductions as to molecular weight are discussed in Chapter 17 by Edsall and Cohn. In Chapter 18, Edsall and Mehl take up the problems of translational diffusion and Brownian movement of proteins; in the succeeding chapter Edsall discusses sedimentation and diffusion in centrifugal fields and the results of ultracentrifugal studies on proteins.

Chapter 20, by Edsall, is devoted to the important subject of behavior of proteins as acids and bases. In the discussion of net charge and total charge in proteins, the author admits that his reasoning involves the addition or removal of protons and of no other ion, but he adheres to the custom of referring to the "binding" of "acid" and "base." This reviewer hopes that in future editions the authors will, in their theoretical treatment of the charges on dissolved proteins, exercise their world-wide authority and abandon this convention in favor of a terminology which suggests the participation of hydrogen or hydroxyl ions, and not that of undissociated molecules.

In Chapter 21, Edsall discusses the determination of viscosity and double refraction of flow in protein solutions and the interpretation of the resulting information with respect to the shape of protein molecules. Chapter 22, by Oncley, is devoted to consideration of the estimation of electric moments and relaxation times by means of the dielectric constants of protein solutions. In Chapter 23, Cohn takes up the theory of the solubility of proteins and Edsall discusses the application of the phase rule to their solubility relations, a procedure of practical value in establishing criteria of homogeneity of protein preparations. In Chapter 24, Cohn and Ferry discuss the detection of interactions of proteins with ions and dipolar ions by determining the relations between solubility and various physical and chemical properties; salting-in and salting-out are here considered. Chapter 25, by Mueller, is devoted to the theory of electrophoretic migration, a subject of increasing practical importance in medicine as well as in protein chemistry.

The volume closes with an appendix containing factual information, a general subject index and tabular indexes of data in the text for certain important amino acids, peptides and proteins.

Like the other monographs in this series, this book is admirably edited and printed. It is, however, not easy reading for the general student, and probably few specialists exist who could take the whole work in their stride. The treatise has great educational value, for investigators as well as for students. It is, moreover, but one of the fruits of the close association, over more than fifteen years, of the unique group of experts in the authors' laboratory, where "freed from the necessity of considering practical applications" they could "make the excursion into the chemistry of protein prototypes which forms the background of this book. . . ."

HANS T. CLARKE

**Treatment of Experimental Data.** By ARCHIE G. WORTHING, University of Pittsburgh, and JOSEPH GEFFNER, Weirton Steel Company. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1943. ix + 342 pp. Illustrated. 15.5 × 23.5 cm. Price, \$4.50.

Bringing to bear the resources of numerical mathematics for the treatment of experimental results is a relatively new procedure in some of the fields where experimental observations are gathered. The reviewer recalls asking a mature student some thirty years ago how he had obtained certain values which had obviously been subjected to a smoothing process. The reply was that "a curve had been drawn among the points." One may indeed sympathize with Professor Worthing when he refers to exasperations engendered over the years by the lack of knowledge on the part of the author of the methods by which experimental data may be fully digested and conveniently presented.

The material of the volume is the culmination in large part of a graduate course in the general treatment of a wide variety of observational material. Everyone who works with observational material, regardless of the particular field, will take a lively interest in the systematic and clear expositions for dealing with data. There are thirteen chapters of which the first three pertain to primary representations followed by one on methods of differentiation and integration. The practical applications and uses of Fourier series including a discussion of analyzers occupy one chapter, and then comes a very sensible presentation of the doctrine pertaining to normal frequency distribution, precision indexes and the technique of least square treatments of data. The concluding chapters contain a brief account of correlation and non-harmonic periodic functions, while an appendix giving the elementary expansion rules for determinants, useful tables, and a copious bibliography complete the volume.

The authors have incorporated a number of features which should prove particularly attractive to students and facilitate the book's use as a text. For example, all symbols used are listed along with ample information about their meaning before the first chapter and the fifth chapter (Fourier series). An abundance of illustrative material from widely different fields is used throughout, each chapter concludes with a summary and a series of problems, and the ensemble of material is knit together in simple direct language. The book is also illustrated with an unusually large number of figures. The authors have made an excellent contribution which will undoubtedly go far to promote the intelligent evaluation of experimental data in all fields of science.

Naturally the authors have had to exercise care not to overexpand the material. The reviewer believes, however, that George Rutledge's method of obtaining a derivative function (*Phys. Rev.*, 40, 262 (1932)) is superior to that based on the Gregory-Newton formula, particularly for machine calculations. This remark holds also for Rutledge's interpolation formulae (*Trans. Am. Math. Soc.*, 31, 807 (1929)). E. V. Huntington (*Am. Acad. Arts Sci.*, 63, 421 (1929)) has also given convenient and extensive interpolation tables.

The printing, typography and form of the volume are excellent.

F. G. KEYES

---

## BOOKS RECEIVED

December 10, 1943-January 10, 1944

- G. F. D'ALELIO. "A Laboratory Manual of Plastics and Synthetic Resins." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 134 pp. \$2.00.
- WILLIAM H. CHAPIN AND L. E. STEINER. "Second Year College Chemistry." Fifth Edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 575 pp. \$3.75.
- E. P. CLARK. "Semimicro Quantitative Organic Analysis." Academic Press, Inc., 125 East 23rd Street, New York, N. Y. 135 pp. \$2.50.
- FRITZ FEIGL. "Laboratory Manual of Spot Tests." Translated from the German Manuscript by Ralph E. Oesper. Academic Press, Inc., 125 East 23rd Street, New York, N. Y. 276 pp. \$3.90.
- CHARLOTTE A. FRANCIS AND EDNA C. MORSE. "Fundamentals of Chemistry and Applications." Second Edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 537 pp. \$3.50.
- HARRY N. HOLMES. "Out of the Test Tube." Fourth Edition, Revised and Expanded. Emerson Books, Inc., 251 West 19th Street, New York, N. Y. 312 pp. \$3.00.
- PIERCE W. SELWOOD. "Magnetochemistry." Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y. 287 pp. \$5.00.
- HENRY TAUBER. "Enzyme Technology." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 275 pp. \$3.50.
- ALEXANDER N. WINCHELL. "The Optical Properties of Organic Compounds." The University of Wisconsin Press, 811 State Street, Madison 6, Wisconsin. 342 pp. Photoprinted. \$5.00.
- "A. S. T. M. Standards on Plastics." American Society for Testing Materials, 260 S. Broad Street, Philadelphia 2, Pennsylvania. October, 1943. 431 pp. \$2.00.