NEW BOOKS

Second Year College Chemistry. By WILLIAM H. CHAPIN, Emeritus Professor of Chemistry in Oberlin College. Fifth edition, revised, by Luke E. Steiner, Professor of Chemistry in Oberlin College. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1943. viii + 575 pp. Illustrated. 14.5 × 22 cm. Price, $3.75.

The passage of five years has brought the fifth edition of this popular and old reliable text, steadily changing in content to better serve its original purpose of extending the frontiers of elementary chemistry. Unfortunately, there is no place in many college programs for the lessons it could teach. In the Preface, Dr. Steiner writes: ". . . Liquids and solutions are discussed more fully and more exactly. A new chapter on crystalline solids relates the dimensions of atoms, ions and molecules to the structure of crystals and chemical behavior, and serves as an introduction to crystal chemistry and to structural chemistry. Similarly, the chapters on liquids and solutions correlate their properties more closely, with chemical behavior. . . . Early chapters place greater emphasis on mathematics, . . . but the kinetic point of view is maintained."

The revision has been extensive, thirteen of the twenty chapters showing an increase of three pages or more, and two chapters only having been shortened. The net increase in pages is 168, including a block of miscellaneous problems at the end. The typography is unchanged, but in keeping with war-time necessity the paper is thinner and the margins are narrower, giving a book no larger than the previous edition.

ALLEN D. BLISS

Laboratory Manual of Explosive Chemistry. By ALLEN L. OLSEN AND JOHN W. GREENE, Kansas State College. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1943. vi + 106 pp. Illustrated. 14 × 22 cm. Price, $1.75.

This laboratory manual is designed for a short course on explosives such as that set up by the Engineering, Science and Management War Training Program, the purpose of which is to provide training in the chemistry of explosives for persons planning to work in explosives and loading plants as (1) inspectors for the Ordnance Department and (2) operators for the manufacturers having contracts in this field. It consists almost entirely of directions for testing, which are taken directly from the War Department Technical Manual 9-2900 (August 29, 1940). Suitable acknowledgment is made to the Technical Manual and no pretense of originality is made.

From the standpoint of a course such as that mentioned above, limitation to the specification procedures of the Ordnance Department is well advised. In evaluating this book, it should be emphasized that the procedures, as given, represent the standard procedures of the Ordnance Department and not the best possible procedures which might be worked out for the various tests. The authors have exerted commendable restraint in avoiding the temptation to devise more elaborate and perhaps more accurate tests.

Since it is mostly a duplication of Technical Manual 9-2900, it may, perhaps, be useful to compare the scope of the Technical Manual with this book. In the latter the details of the manufacture of explosives are omitted, but the methods are illustrated by small-scale laboratory directions. The chief contribution of the Laboratory Manual over the information available in the Technical Manual is the inclusion of a number of explanatory notes summarizing the reasons for various operations and mentioning additional precautions. Another useful feature is a chapter on "Safety," which would answer many of the questions occurring in the minds of people inexperienced in this field who might be given the responsibility for organizing a course on the testing of explosives. The substances for which methods of testing are given are the same as those included in Technical Manual 9-2900. No classified information is included in this book.

The book contains a few errors, but these are not serious and would generally be fairly obvious to the user. The book is not intended to cover the entire field of explosives but is intended, primarily, for those interested in the routine testing of products in current manufacture. It will be of interest and helpful to those participating in courses of this type.

RALPH CONNOR

Quantum Chemistry. By HENRY EYRING, Frick Chemical Laboratory, Princeton University, JOHN WALTER, Palmer Physical Laboratory, Princeton University, and GEORGE E. KIMBALL, Department of Chemistry, Columbia University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1944. vi + 394 pp. Illustrated. 14.5 × 22 cm. Price. $5.00.

Into this book, just over an inch between the covers, the authors have packed a large amount of basic theoretical material, much of it not elsewhere available except in special monographs and reviews. In addition to the standard contents of an elementary text on quantum mechanics there are chapters on group theory, statistics reaction rates, and other applications of interest to the modern theoretical chemist. The presentation is of necessity condensed in style, but is skilfull and accurate (except for an occasional misplaced index or average sign), and no essentials have been omitted. The work will be valuable as a convenient general reference book for the student, and for this purpose has the merit that each chapter can be read by itself, sufficient back references being supplied to indicate where the necessary preliminary material may be found. As an aid to further study, a good bibliography is appended.

A. S. COOLIDGE

Enzyme Technology. HENRY TAUBER. John Wiley and Sons, Inc., New York, N. Y.; Chapman and Hall Ltd., London, 1943. vii + 275 pp. 46 figures. Price, $3.50.

The purpose of this book, according to the author, is to present practical information concerning the role and use of enzymes in industry, their preparation, and their use in medicine. These objectives are achieved, although many of the subjects are not discussed in great detail. Fortunately, there is a generous bibliography included at the end of each chapter, enabling one to refer to the original material. In some cases the author has not followed his original objective. This is true in the discussion on the use of yeast in medicine.

There are sixteen chapters covering the following material:

Yeast: Production and Utilization and the Enzyme Systems
Production of Ethyl Alcohol by Fermentation
The Role of Enzymes in Brewing
Mold Fermentations
Bacterial Fermentations
The Production of Enzymes and Methods of Their Estimation
Enzymes for Medical Use
Enzymes of Grains and Malt and the Role of Enzymes in Bread Making

Enzymes in Dairy Products
Enzymes in the Meat, Egg, Vegetable, and Fruit Industries
Pectin-Decomposing Enzymes and Their Use in the Fruit Juice, Wine, and Jelly Industries
Vitamin-Destroying Enzymes
Enzymes in Textile, Paper, and Related Industries
The Use of Enzymes in the Manufacture of Leather
Enzymes in Other Industries
Microbiological Methods for the Estimation of Vitamins

The individual chapter headings do not always give a reliable index of the contents within the chapter. For example, Chapter VI: "The Production of Enzymes and Methods of Their Estimation," contains methods for the preparation of diastatic enzymes from molds, bacteria and pancreas, and also proteolytic enzymes, whereas the preparation of yeast enzymes, malt diastase, and some other preparations are described in other chapters. The only methods included in this chapter are those covering proteolytic activity, lipolytic activity, and one method for saccharogenic amylase activity. Some of the other methods are given in the respective chapters describing specific enzymes in more detail.

It is believed that it would have been preferable to group the chapters containing material on the amylases together, thereby enabling the author to make possible a more unified treatment of the subject.

The author has confused the starch liquefying property of α-amylase and the as yet unverified amylophosphatase of Waldschmidt-Leitz and Mayer. It is also unfortunate that the models of Hanes for the structure of the starch molecule are given, since it is quite well-established that starch consists of straight-chain amylose and branched-chain amylopectin and the simple Haworth structure is no longer tenable.

The last chapter contains a description of the microbiological assay methods for the six B vitamins.

There are relatively few errors and the binding and printing are quite good. The book is a useful contribution to the growing field of enzyme technology. It covers a broad scope, possibly too broad, but the reader can cover the field more thoroughly with the help of the excellent collection of references given after each chapter.

CHARLES N. FREY
SUTTON REDFERN

General Chemistry, A First Course. By L. E. YOUNG, Professor of Chemistry, Mills College, and C. W. PORTER, Professor of Chemistry, University of California. Revised edition. Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y., 1943. xi + 527 pp. Illustrated. 15.5 × 23.5 cm. Price, $3.75.

This book is, in many ways, better than most texts that have been written lately for beginners. Many glaring faults to be found in texts much used in High Schools and Academies have been corrected. Thus *nascent* hydrogen is not mentioned and a correct explanation is given of the electrolysis of brine. Equation balancing, solving of problems, oxidation–reduction, etc., are explained intelligently and the student is not encouraged to follow the German practice of expressing all chemical arithmetic in terms of ratio and proportion. The book is intended to be used in colleges but it is well suited for use in High Schools although no attempt is made to satisfy the requirements of College Entrance Boards, and it is not a reference book.

As stated in the preface, "The attempt is made to explain the fundamental principles of chemistry in simple language and illustrative matter is drawn from the experiences of daily life." In teaching beginners, the chief difficulty is the approach to the subject because no single element, except perhaps the rare gases, can be studied adequately without reference to other elements. For this reason, the first quarter of the book is rather conversational in style and easy to understand although the reader is expected to swallow considerable dosage about as one takes a pill. Thus on page 3 it is shown that a single molecule of sodium chloride would weigh so little that it would have to be a gas and after stating that matter cannot be created or destroyed a foot-note is inserted which states that the "escape or absorption of heat results in a corresponding loss or gain in matter" and a little later the student is taught that when 20 million tons of coal are burned one pound of it is converted into heat and light. This will almost lead some beginners to think that heat and light can be weighed, which agrees pretty well with conceptions that prevailed in the Middle Ages. In this connection, it may be stated that Physicists often have claimed that Chemists don't understand the difference between *mass* and *weight*.

Subjects such as *isotopes, deuterium, electrons, neutrons* and the *Periodic Table* are discussed early in the book when hydrogen is the only element that has been studied. This rather pleases the reviewer although some may think that this leads to over-emphasis of theory. The elements of crystallography are given on pages 20–22, which leads to the discussion of *space lattice* and the crystal lattice of sodium chloride is shown on page 24.

In general, the descriptive matter concerning the elements and their compounds is adequate for a course given beginners, but some modern ideas concerning acids, bases, salts and the hydronium ion are not mentioned, which will probably displease some good chemists. The law of chemical mass action and the reversibility of most reactions is not discussed adequately and the chapter on the *Electromotive Series* is unsatisfactory because no attention is paid to the concentrations of the ions in solution. In fact, a table of twenty oxidation-potential potentials is given in the Appendix and is stated to pertain to "infinite dilution" although the values given are identical with those usually given for molar concentrations. It is quite likely that the authors themselves do not entirely understand the application of the *Nernst rule* to oxidation–reduction potentials.

The sections on *Organic Chemistry* are excellent and the reviewer is greatly pleased to find the conception that the carbon is negative in CH_4 but positive in CCl_4.

In examining a book for review, one is inclined to overemphasize the things he does *not* like and in reading a text is more likely to underline false statements and misprints than to note excellent points. This book is well-published, is well-written and contains very few false statements or misprints. It might be better if, in the *Table of Contents*, the reference to the *Metric System* were given as page 511 instead of 504, that the definition of *amphoteric* substances be restricted to oxides and hydroxides and that *amorphous* substances be recognized as being in a state of extreme fineness of the particles rather than due to lack of any crystalline form, but enumeration of such things is more or less captious and the reviewer hopes he has made it clear that he likes the book.

WILLIAM T. HALL

The Physical Chemistry of Electrolytic Solutions. By HERBERT S. HARNED, Professor of Chemistry, and BENTON B. OWEN, Associate Professor of Chemistry, Yale University. (American Chemical Society Monograph Series.) Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y., 1943. xi + 611 pp. Illustrated. 15.5 × 23.5 cm. Price, $10.00.

Appearing twenty years after the publication of both Debye and Hückel's first papers on the interionic attraction theory and Lewis and Randall's "Thermodynamics," "The Physical Chemistry of Electrolytic Solutions" rounds out one period in the development of solution theory. This is the period in which the physical chemists have been taught to use exact thermodynamics in the treatment of solutions and to use the Debye theory for extrapolation to solutions too dilute for accurate experimental measurements. The authors consider the Debye theory sufficiently established so that they take the first five chapters to develop the theory before making any comparison with experiment to check its validity. The second group of five

chapters discusses experimental methods beginning with the irreversible effects and ending with electromotive force measurements, which make a smooth transition to the last group of five chapters which discuss the equilibrium properties of various types of solutions, particularly those studied in the Yale laboratories.

During this period it has been necessary to make a large number of measurements upon simple systems to verify the theory, to discover the nature of the transition from solutions so dilute that the theory is exact and measurements are impossible to those so concentrated that the theory becomes too complicated but measurements are relatively easy, and to obtain a body of correlated data for the study of concentrated solutions. Most of the more accurate results are presented in the last ten chapters.

Theoretical studies are much less well presented than experimental work. So much of the book is based upon the Debye theory that one might expect a thorough discussion of its derivation. However, the investigations of the statistical basis are limited to a footnote citation, and there is no discussion at all of the fact that the Debye equations are derived for a very special model with all the ion spheres of the same size, and no mention of the attempts to determine the deviations to be expected when these conditions are not fulfilled.

The book is weak in a few places where we might expect it to be strongest. The equation which is the basis of the treatment of the thermodynamics of "The Reversible Galvanic Cell," equation 1-5-1, cannot be derived from equation 1-2-6 by any method known to me. Equation 1-5-5, which is called "the equation for concentration cells," is not used as such either in this book or elsewhere as far as I know. In the "General Statement of the Interionic Attraction Theory" (Chapter 2) an outline of the complicated mathematical framework of the Onsager–Fuoss treatment of irreversible processes is followed by a simplified derivation of the Debye potential, neglecting the ionic diameter. The mathematics of the proper derivation, which has to be given in the next chapter, is so much simpler than that of the preceding sections that there seems no excuse for an approximate derivation here. The case is aggravated by two errors in the derivation. From the fact that κA is not a function of r, it does not follow that κA must vanish as κ approaches zero; even if this were true, it would not follow that A is not a function of κ.

The authors have a difficult problem in the treatment of non-reversible processes. The mathematics is so complex that it cannot be presented completely, yet there should be enough to illustrate the methods. How much should be presented? Although my own taste would have been for more space devoted to a physical picture and less to the mathematics, I think the compromise chosen by the authors is a good one.

Their treatment of numerical results involves another problem which is not so wisely handled. The data from the Yale laboratories are computed with the Lewis and Randall–"International Critical Tables" values of fundamental physical constants, like most data in the literature, and with values for the fundamental hydrochloric acid concentration cell based on smoothing less skillful than the present practice. These values are given in the book with the explicit excuse for the incorrect constants that the errors "are generally less than the errors in the physicochemical data with which they are combined." Hanging on to erroneous quantities is much like drug addiction. Each paper published with the old values makes it more difficult to give them up for the new. The better the paper, the worse is its effect. A book like the present makes the recovery of the authors almost impossible, and the publication of many convenient tables in chapter 5 tempt others to the same bad habits. This chapter should not have been allowed to appear without a poison label. For freezing point measurements the discrepancy is greater though not used so much. Attention should be called to the fact that the most probable value of the constant for water is 1.860 and not 1.858.

The most valuable part of the book is the bringing together of experimental work. Chapter 6 covers conductance, transference, viscosity and diffusion. Chapter 7 treats the relation of conductance to the electrostatic formation of ion pairs and higher complexes and to the association of weak electrolytes, the effect of frequency on conductance and dielectric constant, and the effect of field strength on the former. In Chapter 8 are presented thermochemical quantities, partial molal volumes and coefficients of expansion and compressibility. Chapter 9 discusses freezing points, boiling points and vapor pressures. Chapter 11 treats hydrochloric acid; chapter 12 covers other strong 1-1 electrolytes in aqueous solution, including their effect on non-electrolytes. Chapter 13 is devoted to polyvalent electrolytes in aqueous solution. Mixtures of strong electrolytes are discussed in Chapter 14, and weak electrolytes in Chapter 15. The appendix collects tables which would have spread out the text too much if included earlier. These later chapters are, quite properly, built around the electromotive force measurements in the Yale laboratories and emphasize those electrolytes which can be studied by this method. The only chemical reaction discussed is the acid-base equilibrium. Every worker in the field will be grateful to the authors for the labor they have spent collecting and coördinating this material, and will need to have a copy easily accessible.

A glossary of symbols at the beginning is very helpful. The convenience as a reference book could have been increased greatly by having the chapter and section numbers at the top of each page. Trivial slips like typographical errors, split infinitives, and stabilization energy from proton resonance have been kept infrequent, though they have not been entirely eliminated.

GEORGE SCATCHARD

BOOKS RECEIVED

April 10, 1944—May 10, 1944

ROGER ADAMS, Editor-in-Chief. "Organic Reactions." Volume II. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 461 pp. $4.50.

R. BOWLING BARNES, ROBERT C. GORE, URNER LIDDEL AND VAN ZANDT WILLIAMS. "Infrared Spectroscopy. Industrial Applications and Bibliography." Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 236 pp. $2.25.

D. R. HOAGLAND. "Lectures on the Inorganic Nutrition of Plants." The Chronica Botanica Company, Waltham, Mass., G. E. Stechert and Company, New York, N. Y. 226 pp. $4.00.

NORBERT ADOLPH LANGE, Compiler and Editor. "Handbook of Chemistry." Fifth Edition, Revised and Enlarged. Handbook Publishers, Inc., Sandusky, Ohio. 1777 pp. plus Appendix and Index. $6.00.

GUSTAV SEIFFERT. "Virus Diseases in Man, Animal and Plant." The Philosophical Library, Inc., 15 E. 40th Street, New York 16, N. Y. 332 pp. $5.00.

C. H. S. TUPHOLME. "Twentieth Century Engineering." The Philosophical Library, Inc., 15 East 40th Street, New York 16, N. Y. 201 pp. $3.00.

"The Oxy-Acetylene Handbook. A Manual on Oxy-Acetylene Welding and Cutting Procedures." The Linde Air Products Company, 30 East 42nd Street, New York 17, N. Y. 587 pp. $1.50.

"Proceedings of a Conference on the Ultra-fine Structure of Coals and Cokes, held at The Royal Institution, London, June 24th and 25th, 1943." The British Coal Utilization Research Association. H. K. Lewis and Company, Ltd., 136 Gower Street, London, W.C.1, England. 366 pp. 25s.