

(Calcd. for $C_{29}H_{52}O_3$: C, 77.6; H, 11.6. Found: C, 77.2; H, 11.7) and by its oxidation with selenium dioxide to give cliostene-(4,5)-diol-3,6; m. p. 232°; $\alpha_D + 8^\circ$ (Calcd. for $C_{29}H_{50}O_2$: C, 80.9; H, 11.6. Found: C, 81.1; H, 11.7). The

diol yields clionastenone upon dehydration with acids.

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NEW BOOKS

The Theory of Organic Chemistry—An Advanced Course.

By GERALD E. K. BRANCH, Ph.D., Professor of Chemistry, and MELVIN CALVIN, Ph.D., Instructor in Chemistry, University of California. Prentice-Hall, Inc., New York, N. Y., 1941. xix + 523 pp. 49 figs., 55 tables. 15 × 23 cm. Price, \$4.00.

"The Theory of Organic Chemistry—An Advanced Course" is the most ambitious attempt yet made to describe the phenomena of organic chemistry in terms of the electronic structural theory as it has been enriched by modern quantum mechanics. It is written as a textbook for an advanced course implying a previous knowledge of physics, physical chemistry, mathematics, and some organic chemistry.

Three introductory chapters provide a generalized presentation of the development of the organic structure theory, of the theory of atomic structure, and of their meeting ground in the modern concepts of molecular structure. Chapter 4 considers the modes of interaction of groups in the molecule and introduces the concept of resonance. There follows a chapter on the interpretation of physical properties in relation to structure, including bond distances and angles, dipole moments, Raman spectra, and color. Chapters 6 and 7 deal with equilibrium and energy relationships in acid dissociation, tautomerism, addition reactions and free radicals. Chapter 8 derives and illustrates some general equations of kinetics. Chapter 9, entitled "Three-Center Reactions," discusses acid-base catalysis, the Walden inversion, solvolytic and displacement reactions. The final chapter deals with miscellaneous reactions of the double bond, culminating in aromatic substitution.

The presentation of the subject is deductive rather than inductive. Full expositions are given in generalized notation, followed by a descent to experimental illustrations. In this regard the style emphasizes the kinship of the authors' viewpoint with that of Professor C. K. Ingold, to whose leadership they pay appreciative tribute in the preface.

The strongest parts of the book are those dealing with structural problems. The various discussions of resonance and its implications for organic phenomena are the best yet written, and ought to be required reading for those writing casually on this subject for the *Journal*. Many pertinent examples are cited in these discussions, although fuller documentation would have been desirable. With

occasional exceptions, such as the bond angles of the halo-methanes (p. 135), the interpretation of the dissociation constants of the dibasic acids (pp. 226-228) and the structure of aliphatic diazo compounds (p. 411), the book is up to date. It is attractively set up and well bound. The authors have not neglected those important finishing touches, the proofreading and the index.

P. D. BARTLETT

Principles of General Chemistry.

By STUART R. BRINKLEY, Associate Professor of Chemistry, Yale University. Third Edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1941. x + 703 pp. Illustrated. 16 × 24 cm. Price, \$4.00.

The third edition has been much enlarged and considerably altered. The chapters dealing with the physical properties and structure of matter have been brought to the first part of the book in order to give a better basis for the theoretical discussions occurring later. The structure of the atom has been used to a much greater extent than formerly as a basis for explaining chemical action. The conception of complete ionization and the use of the Brönsted definition of acids and bases are carried out logically throughout the book.

Considerable emphasis has been put on the idea of oxidation number. While the author has made it clear that this number takes no direct cognizance of the distinction between covalent and ionic union, the question arises as to whether or not the young student will understand its empirical quality. The ion-electron method of balancing oxidation equations is, however, presented for use in water solution.

In general the book is an excellent one and is recommended for students who have had considerable previous preparation in chemistry.

P. A. BOND

Catalysis, Inorganic and Organic.

By SOPHIA BERKMAN, JACQUE MORRELL and GUSTAV EGLOFF of Universal Oil Products Company Research Laboratories. Reinhold Publishing Corporation, 330 West 42nd St., New York, N. Y., 1940. 1130 pp. Price, \$18.00.

The first chapter of 57 pages is devoted to the historical development of the subject and a theoretical discussion.

This chapter is not interesting or particularly important as no theory has been proposed that will cover more than a limited amount of experimental data.

Chapter II of 92 pages treats principally the various types of adsorption and their bearing on the energy factors involved in the activation of reactants.

Chapter III (65 pages) is devoted largely to the subject of homogeneous catalysis.

In chapter IV (84 pages) are discussed methods of measuring catalytic activity, the relation of catalytic activity and method of preparing the catalyst and reactivation of the catalyst after use.

Chapter V (32 pages) includes the discussion of the mechanism of inhibition and inhibitors in autocatalysis and anti-knock substances.

Chapter VI (82 pages) is devoted to the discussion of promoters and poisons in catalytic reactions.

Chapter VII (85 pages) contains a discussion of carriers in heterogeneous catalysis.

Chapter VIII (130 pages) discussed under separate headings the following subjects—catalytic oxidation, catalytic hydration and dehydration, catalytic hydrogenation, catalytic halogenation, catalytic alkylation, catalytic condensation and polymerization.

In Chapter IX (13 pages) are discussed the physical conditions in catalytic reactions.

In Chapter X (347 pages) catalysts are classified with respect to types of reactions and is subdivided as follows: I. Catalysts for various types of reactions. II. Catalytic synthesis (inorganic). III. Catalytic synthesis (organic). IV. Catalytic decomposition (inorganic). V. Catalytic decomposition (organic). VI. Catalytic hydration (organic). VII. Catalytic dehydration (organic). VIII. Catalytic reduction. IX. Catalytic oxidation (inorganic). X. Catalytic oxidation (organic). XI. Catalytic hydrogenation (organic). XII. Catalytic dehydrogenation (organic). XIII. Catalytic halogenation. XIV. Catalytic nitrogenation, denitrogenation, sulfurization and desulfurization. XV. Catalytic alkylation. XVI. Catalytic condensation (organic). XVII. Catalytic polymerization (organic). XVIII. Catalytic isomerization (organic).

Chapter XI (88 pages) contains a discussion of the use of catalysts in the petroleum industry divided as follows: High octane motor fuels, synthetic motor fuels from coal, synthetic pure hydrocarbons, catalytic refining processes and sources of hydrocarbons.

So much for the skeleton outline of the book. Its 1130 pages are no indication of the wealth of material to be found, discussed or referred to. It is in fact the most comprehensive single volume on the experimental facts of catalytic chemistry in existence. One gets an idea of the amount of material called to the reader's attention when one is aware that of its 1130 pages approximately 500 pages consist of tabulated material and references to the literature including patent literature and in addition much space is saved by the liberal use of curves.

This volume will undoubtedly prove of great use to any one interested in the fields of catalysis not merely because it gives a very complete survey of the literature but the arrangement is such that it will serve as a useful guide in seeking catalysts for particular reactions. It is too much

to expect the first edition of a volume like this to be devoid of errors. On the other hand, its usefulness is to a great extent dependent on its accuracy. Reference to Thomas Graham, the father of Colloidal Chemistry as von Graham is not a mistake that will detract from the usefulness of the book nor is the confusion of Avogadro's number with the so-called Loschmidt's number a serious matter. However, the confusion of Rhenium and Rhodium is different. The reviewer has noted also more errors in the references to the literature than a book of this kind should have. However, there is no doubt that it is the best single reference book for any one interested in the applications of catalysts in either the field of pure or applied chemistry. The chapter on the application of catalysts in the petroleum industry is both excellent and timely.

J. C. W. FRAZER

Kurzes Lehrbuch der physikalischen Chemie. (Brief Textbook of Physical Chemistry.) BY DR. HERMANN ULICH, der technischen Hochschule, Aachen, with the assistance of Dr. Habil. KURT CRUSE, der technischen Hochschule, Aachen. Second edition. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden, Germany, 1940. xvi + 324 pp. 79 figs. 16 × 24 cm. Price, RM. 9.00.

The first edition of this text (1938) has had a very friendly reception in German schools. It has been previously reviewed, *THIS JOURNAL*, **61**, 1298 (1939). The second edition is almost exactly the same as the first, except for some numerical corrections and the expansion of several sections to the extent of a total of three or four pages. The German is easy reading, and the treatment, while summary, is excellent.

EDWARD MACK, JR.

Temperature Measurement. By ROBERT L. WEBER, School of Chemistry and Physics, Pennsylvania State College. Lithoprinted by Edwards Brothers, Inc., Ann Arbor, Michigan, 1941. 21 × 27.5 cm. Paper covers, price, \$2.50.

This book is one containing the substance of a single semester course given to juniors. It is divided into three parts, the first being fifteen chapters (112 pages) of text with sets of problems at the end of each chapter, the second containing twenty-two laboratory experiments (29 pages), and the third an appendix consisting of twelve tables (13 pages). The title is somewhat misleading, for the subjects of heat transfer, temperature control, calorimetry, elementary thermodynamics, thermal conductivity, thermal analysis by means of cooling curves, and gaseous viscosity are included, in addition to subjects properly relating to temperature measurement such as thermoexpansion, thermoelectric, resistance, radiation and recording thermometry, and temperature scales.

There are errors of various sorts scattered throughout this book. In many figures no lettering appears when it is called for by the accompanying discussion, and many figures are too small or too indistinct. On page 2, for the Rankine Scale, the steam point value and the interval be-

tween the steam point and the ice point are incorrectly stated. On page 40 the wrong sequence of Planck's development of the radiation law and of the quantum theory is given. On page 80 the wrong chemical symbol for calcium carbonate occurs thrice, and on page 81 an incorrect deduction from the Phase Rule is made. On pages 87 and 93 it appears as if no distinction between the physical and the chemical atomic weights is made by this author. On page 105 the word absorption is thrice written for adsorption. On page 122 the transition temperature of sodium sulfate anhydrous (symbolized) is mentioned when the transition temperature of the decahydrate is meant. There are many other errors and misprints. The word thermal does not seem to be mentioned. Certain of the definitions are stated in rather complex form.

The author states in his preface that it is hoped that the manner in which the material is presented will aid the student in attaining certain broad objectives common to all sciences. This reviewer cannot help but feel that the author has not succeeded any too well in realizing this hope. It appears that many of the subjects treated could best be left to physics and to physical chemistry courses with more space devoted to fundamentals, both theoretical and practical. It is doubtful whether many teachers will wish to utilize this text exactly as it is now set up. There is a certain amount of information collected in one place which is not available otherwise as such.

EDWIN E. ROPER

The Photochemistry of Gases. BY WILLIAM ALBERT NOYES, JR., Professor of Chemistry, University of Rochester, and PHILIP ALBERT LEIGHTON, Professor of Chemistry, Stanford University. American Chemical Society Monograph Series. Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y., 1941. 475 pp. 66 figs. 16 × 23.5 cm. Price, \$10.00.

This monograph is an excellent survey of the photochemistry of gaseous systems—the best book yet to appear in this field. The authors have produced a volume which is a happy combination of theory, experimental technique and an assessment of results and their interpretation.

A brief introductory chapter is followed by a discussion of experimental photochemical technique. Such topics as reaction cells, light sources, spectrographs and monochromators, filters, determination of absorption coefficients, thermopiles and chemical actinometers are considered authoritatively and in considerable detail. Common sources of error, and how to avoid them, are mentioned frequently. This is succeeded by a well written chapter giving a survey of the theory of the spectroscopy of atomic systems and of diatomic and polyatomic photo-lytes from the standpoint of the photochemist. This section should be extremely valuable to the average graduate student in chemistry.

Next follows a chapter on photochemical kinetics and the determination of mechanisms, including a 32-page review of thermal gas reaction kinetics. Factors which often bother the modern photochemist, such as correction for dark reaction, local and over-all rates, continuous *vs.* intermittent light, are discussed. The remaining three chapters deal systematically with typical photochemical reac-

tions resulting from absorption of light by (a) atoms, (b) diatomic molecules and (c) polyatomic molecules. In general, after an examination of the absorption spectrum of the photolyte, there follows a discussion of the experimental results and their interpretation. In these discussions the authors have taken an impartial, critical attitude and have attempted to evaluate suggested reaction mechanisms on the basis of all the information available. Authors who adopt such an attitude cannot help but find themselves in disagreement with at least some of the workers in the field. To stimulate the progress of science this point of view is to be highly commended but is taken too infrequently by writers of scientific books.

The monograph concludes with appendices giving summaries of photochemical data arranged systematically in tabular form according to types of substances undergoing photolysis. This summary appears remarkably complete and should prove of great service to workers in the field.

"The Photochemistry of Gases" is to be heartily recommended and the authors congratulated on a job well done. To students in courses in photochemistry it supplies a wealth of material aside from the "pet" reactions and topics to which any lecturer must, due to lack of time, confine himself. The investigator in photochemistry will derive profit from the theoretical discussions, the experimental hints, the critical assessment of present results which should suggest problems for further study, and the very complete bibliography of photochemical data. It is to be hoped that the high price of the book will not discourage prospective purchasers.

EDWIN O. WIIG

BOOKS RECEIVED

December 10, 1941–January 10, 1942

JACQUES CATTELL, Editor. "Biological Symposia. Volume V." The Jacques Cattell Press, Lancaster, Pa. 247 pp.

J. W. MELLOR. "Intermediate Inorganic Chemistry." New edition, revised by H. Irving. Longmans, Green and Company, Inc., 55 Fifth Avenue, New York, N. Y. 690 pp. \$3.00.

J. A. STRATTON, P. M. MORSE, L. J. CHU and R. A. HUNTER. "Elliptic Cylinder and Spheroidal Wave Functions, including Tables of Separation Constants and Coefficients." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 127 pp. \$1.00.

CHARLES ALLEN THOMAS, in collaboration with MARY BALUK MOSHIER, HERBERT E. MORRIS and ROSS W. MOSHIER. "Anhydrous Aluminum Chloride in Organic Chemistry." Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. (A. C. S. Monograph Series.) 972 pp. \$15.00.

"A. S. T. M. Standards on Rubber Products." Prepared by A. S. T. M. Committee D-11 on Rubber Products. December, 1941. American Society for Testing Materials, 260 S. Broad Street, Philadelphia, Pa. 280 pp. \$1.75.