

The reaction is evidently as follows: $RRN-NO_2 + HOH \rightleftharpoons RRNH + HONO_2$, the water which is present in the concd. sulfuric acid being effectively involved, and nitric acid being produced. The belief that nitric acid is produced when concd. sulfuric acid acts on tetryl is suggested by the fact that tetryl gives a blue color with the diphenylamine reagent, and is shown to be true by the circumstance reported by Cope and Barab⁵ that the nitro group of tetryl (and of certain other nitro-amines such as nitro-urea and nitroguanidine) is quantitatively converted into nitric oxide in the nitrometer. The present reaction then is the reverse of the familiar one in which methylpicramide is nitrated to tetryl.

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NEW BOOKS

Radioactivity, and the Latest Developments in the Study of the Chemical Elements.

By K. FAJANS, Professor of Physical Chemistry in the University of Munich.
Translated from the fourth German edition, by T. S. WHEELER AND W. G. KING.
E. P. Dutton and Company, 681 Fifth Avenue, New York. xvi + 138 pp. 11 figs.
22.5 × 14.5 cm. Price \$3.50.

The first edition of Professor Fajans' small monograph was published in the middle of 1919 and immediately received a warm reception. As a worthy member of the excellent "Sammlung Vieweg" it brought up to date the special subject of the influence of radioactivity and the study of nuclear properties on fundamental chemical conceptions, and presented the actual state of the subject in a form readily accessible to all readers with a general scientific equipment. In spite, however, of the simplicity of the presentation, the book was complete, authoritative, and well stocked with references to the literature, so that it filled somewhat the place held by Soddy's "Chemistry of the Radio-elements" a few years earlier. The fourth German edition, of which this book is a translation, brought the subject up to the end of 1921, and the appendix to the present English translation includes references to some work published as late as early 1923. The book is well arranged and interestingly written, and has many good diagrams and plates. The translation is good for the most part, but shows some evidences of lack of clear appreciation of the force of certain German idioms. Professor Fajans is to be congratulated on a fair and even generous exposition of controversial themes and on a wise decision to conform to general usage in the matter of the definition of "element." Fajans had vigorously maintained for years that we must call each isotope a different element, while Paneth and others had explained the value of calling isotopes merely *varieties* of the same element. In this edition the author gracefully bows to the weight of opinion.

NORRIS F. HALL

⁵ Cope and Barab, *THIS JOURNAL*, **38**, 2552 (1916).

Differential Equations in Applied Chemistry. By FRANK LAUREN HITCHCOCK, Ph.D., Associate Professor of Mathematics in the Massachusetts Institute of Technology, and CLARK SHOVE ROBINSON, S.M., Assistant Professor of Chemical Engineering in the Massachusetts Institute of Technology. John Wiley and Sons, Inc., New York; Chapman and Hall, Limited, London; 1923. vi + 110 pp. 15 figs. 19 × 12.5 cm. Price \$1.50 net.

As stated very clearly in the first chapter, "It is a very significant fact that at the present day all phases of human thinking tend to become more analytical and more exact, for such is the very spirit of a scientific age." Chemistry, as one of these "phases," has passed through the stage of being merely a descriptive branch of knowledge and is becoming more and more an "analytical and exact" science. It is, therefore, of the greatest importance that the chemist should learn to manipulate the calculus and differential equations with the same ease as the physicist.

The present volume, although frankly limited in its scope, is a splendid introduction to the application of calculus to chemistry and chemical engineering. The object of the book, as stated by the writers, is to teach the student how to use the language of the calculus as "a labor-saving tool of the greatest importance."

The cases chosen for discussion are naturally those which are most useful to the chemist. Thus the second and third chapters contain a discussion of first order and second order reactions, respectively. In the fourth chapter the authors discuss side reactions and successive reactions. Chapter V, entitled "Equations of Flow," introduces the student in a simple manner to Fourier's partial differential equation for heat conduction and its solution in terms of a trigonometric series. Graphical methods for the evaluation of integrals are discussed in the last chapter.

Copious examples which are instructive from a chemical point of view and illustrative of the different typical cases are given at the end of each chapter.

The reviewer would question the wisdom of stating on p. 11 that e is called the *natural* base because "it enters inevitably and naturally in so many problems of physics and chemistry." Might it not have been better to point out mathematically that e is the natural base? However, this is a minor question of pedagogy. On the whole, the student ought to profit by such a volume and should be able, after mastering its contents, to browse with greater interest in such books as those of Mellor and Ingersoll and Zobel.

Einfache und Fraktionierte Destillation in Theorie und Praxis (Simple and Fractional Distillation in Theory and Practice). By Prof. Dr. C. v. RECHENBERG. Schimmel and Co., Miltitz, Leipzig, Germany, 1923. xv + 814 pp. 134 figs. 16 × 24.5 cm.

This book is a second edition of a part of a book by the same author, entitled "Theorie der Gewinnung und Trennung der ätherischen Oele durch Destillation" (Theory of the Production and Separation of Ethereal Oils by Distillation), which appeared in 1910; it is entirely revised and considerably enlarged.

The author first discusses the vaporization of simple substances and the measurement of boiling points and vapor pressures. This is followed by compendious tables, which appear to be complete, of all accurately known vapor-pressure curves. Full references to the original literature from which these data are derived are also given.

Various relationships between temperature and vapor pressure are then critically discussed, the little known rule of Dühring in particular being discussed at considerable length, and its great accuracy and utility pointed out. A special chapter is devoted to the correction of boiling points to standard atmospheric pressure.

There is another interesting chapter relative to the vapor pressures of very involatile substances, such as platinum and silica, at room temperature, and the author reaches the unorthodox conclusion that the vapor pressures of such substances are strictly zero, or—more generally stated—that there is a characteristic temperature for every substance, a so-called absolute zero-point of volatility, below which the substance exerts *no* vapor pressure. A table of such zero-points of volatility for a number of important substances is given.

The author also discusses, on the basis of new experimental evidence, Bancroft's law relative to compound formation when the vapor-pressure curves of the components of a liquid mixture cross, and he concludes that this law has a much wider application than has been ascribed to it by previous investigators.

There follow long chapters on the distillation of all sorts of mixtures, both binary and ternary, as well as on distillation and fractionation on an industrial scale. There is also an interesting and suggestive chapter on compounds of indefinite composition.

The presentation is simple and non-mathematical throughout. American work in this field does not appear to have been very fully treated. There is, for instance, no mention of the important and extensive work of American investigators on the partial vapor pressures of binary mixtures.

The particularly important features of the book appear to be the very extensive and well arranged tables of experimental data, the well executed diagrams, and the many valuable suggestions and directions for experimental work.

A Course in General Chemistry, Including an Introduction to Qualitative Analysis, for Use in Colleges. By WILLIAM C. BRAY, Professor of Chemistry in the University of California, and WENDELL M. LATIMER, Assistant Professor of Chemistry in the University of California. The Macmillan Company, New York, 1923. viii + 148 pp. 1 fig. 22 × 15 cm. Price \$1.60.

This Course in General Chemistry consists of the following sections: (I) Weight Relations in Chemical Reactions; (II) Ionic Theory, Rapid Reversible Reactions and Equilibrium; (III) Reactions of Ions; (IV) Reactions of Ions Continued, Including Oxidation and Reduction; (V) Qualitative Analysis.

How different from the ordinary laboratory manual! Why not the time honored methods of preparation? Perhaps an answer can be obtained by reading the aim of the authors which is expressed by Hildebrand, "We have been inspired by the opportunity offered by a fundamental course to present science in such a way as, first, to win for scientific careers the keen-minded students who are repelled by the drudgery and memory work of the old-fashioned course in descriptive chemistry, and, second, to encourage the average student to adopt the scientific attitude towards his everyday problems. Our aim in giving this course is not simply to teach chemistry, but through it to teach science," and he might have continued by saying that they were more interested in the method of obtaining results than the results themselves. In other words, this course is fundamentally interested in teaching men to think, in the ability to apply knowledge rather than the obtaining of meaningless facts.

As the outline shows, the authors have not hesitated to present the most fundamental theories of chemistry without the preparation of hydrogen, oxygen, etc., and they have so arranged the experimental work with questions and suggestions as to make these principles not only understandable but usable.

One paragraph that particularly appeals is as follows. "Hypothetical mechanisms which have no experimental basis should be carefully avoided, such as the assumption that reduction of nitric acid by metals depends upon the formation of nascent hydrogen, or that the cathode process in the electrolysis of sodium chloride consists in the formation of metallic sodium followed by its reaction with water."

The book is not self-teaching and thus will depend for its success, to a considerable extent, upon the instructors in charge, but for use in small sections it seems almost ideal.

Whatever the teachers of General Chemistry may think of this book, they will all agree that it is something new, and if for no other reason it deserves the thoughtful consideration of all. To the reviewer, it signifies one more step in the right direction, in the presentation of a subject as interesting and all-inclusive as chemistry.

JOHN B. ZINN

Laboratory Chemistry for Girls. By AGNES FRENCH JAUQUES, Head of the Science Department, Vocational High School, Minneapolis. D. C. Heath and Company, Boston, New York, Chicago, London; 1923. ix + 244 pp. Illustrated. 19 × 12.5 cm. Price \$1.48, postpaid.

Miss Jaques is to be congratulated on producing a set of very carefully worked out experiments which can be performed with simple equipment and the minimum of manipulative skill, but which are nevertheless calculated to provoke thought and stimulate inquiry and discussion on the part of the students.

The most serious criticism to which the book is open is a lack of any apparent motivation in the arrangement of the inorganic experiments. In the first five experimental periods the demonstrations deal with the chemical characteristics of chlorine, bromine, iodine, phosphorus, potassium and sodium, while the class is called upon at the same time to learn the names, symbols, and one or two compounds and uses of 40 elements arranged in alphabetical order. Again, the flame tests for the metals are introduced casually in the midst of the study of drinking water.

On the other hand, the experiments in physiological and food chemistry, which make up almost half the book, are admirable, and the course as a whole is likely to appeal much more strongly to the natural interests of a class of girls than does the traditional "general" chemistry course with its main emphasis on inorganic reactions.

ANNIE LOUISE MACLEOD

Allen's Commercial Organic Analysis. Vol. I. Fifth edition, revised and in part rewritten. Edited by S. S. Sadtler, E. C. Lathrop and C. Ainsworth Mitchell. P. Blakiston's Son and Company, 1012 Walnut Street, Philadelphia, Pennsylvania, 1923. viii + 796 pp. 105 figs. 24 × 16 cm. Price \$7.00.

The new fifth edition of Vol. I of this well-known and standard work follows in general plan the fourth edition which was published in 1912. There have been many changes in the personnel of the staff; the editors and the authors or revisers of six of the ten chapters in this volume are not the same as in the earlier edition. One half of the chapters have been written by Englishmen and the remainder by Americans. Many changes and additions have been made which have expanded this volume from 576 pages in the fourth edition to 796 in the fifth.

The sections dealing with paper, sugar and methyl alcohol have been revised most extensively and new sections describing the analysis of butyl alcohol, *isopropyl* alcohol and lactic acid have been added.

The name "Methanol" is given as only a synonym for methyl alcohol and not used consistently through the text in accordance with the best American practice. The old spelling "sulphur" is retained instead of the spelling "sulfur" used in *Chemical Abstracts* and other publications of the American Chemical Society. Since the book under review is a joint

British and American publication, the editors cannot be severely criticized for following the more conservative British practice, but it is to be regretted that the British journals could not have been persuaded to make the change at the same time it was made in the United States. But if the editors of this international publication would courageously make the change it would help our more conservative British cousins to become accustomed to the simpler spelling and thus hasten a change in practice which is inevitable in the long run.

The new edition of Vol. I of Allen's Commercial Organic Analysis will be indispensable in any laboratory where analyses of organic materials are carried out.

GRINNELL JONES

Lead: Its Occurrence in Nature, the Modes of its Extraction, its Properties and Uses, with Some Account of its Principal Compounds. By J. A. SMYTHE, Ph.D., D. Sc., Reader in Chemistry and William Cochrane Lecturer in Metallurgy, Armstrong College, in the University of Durham, Newcastle-on-Tyne. Longmans, Green and Company, 55 Fifth Avenue, New York; 39 Paternoster Row, London, E. C. 4; Toronto; Bombay, Calcutta and Madras; 1923. vii + 343 pp. 38 figs. 22.5 × 14.5 cm. Price \$5.25.

The book begins with an historical review, which is necessarily brief, but interesting, and to one who is familiar with the matter shows thorough study. It is then evident that the author is a mineralogist experienced in field collection, and presents the most complete data yet assembled. This is an outstanding feature of the book, and quite satisfactory. The treatment of metallurgical questions is chiefly chemical, with only enough descriptive matter to make the chemical discussions intelligible, and is by far the most thorough and stimulative that has yet appeared on lead; it is evidently the study of many years, and is annotated with references in great completeness; in a few cases these show typographical errors, but not very serious ones. These original papers seem to have been carefully read; their chemical theories are extensively and lucidly explained. It is inevitable that one or another reader will differ with the author both as to theory and results; but this book is a storehouse of suggestive study, and instructive to all; its exposition of American practice is extensive and good, but perhaps not quite as well up to date as of that of the older countries. No lead metallurgist should be without this book.

A. H. SABIN