

chapter. Of the many reactions covered, the discussions on the reactivity of sulfite with aromatic nitro compounds and with benzyl alcohols are especially thorough.

In the fifth chapter, standard quantitative and qualitative methods of detection for sulfurous acid salts are presented together with the special methods needed for sulfite estimation in foods and beverages.

In the next chapter, the food and beverage applications are discussed. The importance of understanding the chemical reactivity of sulfurous acid salts with sugars, proteins, vitamins, and the like is effectively stressed, and the use of sulfurous acid in specific food preservation is extensively covered.

"Pharmaceutical Applications" comprises chapter seven. There are essentially three major topics in this chapter: (a) practical aspects, (b) theoretical considerations, and (c) an extensive listing of specific applications to various drugs.

The monograph ends with a chapter on the toxicity of sulfur dioxide. Plant, human, and animal toxicity is reported.

As T. Higuchi states in the foreword, this simple compound touches us all—from the preparation of dried apricots to free radical chemistry. Under one cover, Dr. Schroeter has provided us with a reference covering all aspects of sulfur dioxide—from utility to chemical reactivity.

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*Clinical Pharmacy: A Text for Dispensing Pharmacy.* By GLENN L. JENKINS, GLEN J. SPERANDIO, and CLIFTON J. LATIOLAIS. McGraw-Hill Book Co., 330 West 42nd St., New York, N.Y., 1966. viii + 379 pp. 15 × 22.5 cm. Price \$11.95.

In their preface, the authors state that their text is to be a departure from the conventional text of compounding and dispensing. The use of the term "clinical" in the title implies the intent of the authors to create a text for a course in dispensing pharmacy given immediately before graduation. It indicates a modern text which will help prepare the student to practice his profession not only as a capable pharmacist today, but also as an informed pharmacist tomorrow.

It is the opinion of this reviewer, however, that "Clinical Pharmacy" falls far short of its worthy goal. Indeed, instead of being a text for advanced students, it more appropriately belongs to that textbook class suitable for the beginning pharmacy student.

In addition to the topics normally covered in a dispensing text of pharmacy, it is heartening to note the chapters on allergenic extracts, investigational drugs, clinical research, the pharmacy as a drug information center, and pharmacy service in small hospitals and nursing homes. A chapter on the ethical and moral aspects of the profession and the relationship between a pharmacist and his patron, should have been added to complete the text. While the material covered in these chapters is necessary, more emphasis could have been placed on the relationship of the community pharmacist with the activities described.

The balance of the text is a shallow treatment of the subjects normally discussed in other dispensing

texts. The depth to which a senior student ought to be taken in these subjects is never achieved.

As an example, the chapter on controlled release dosage forms never gets into the problem of evaluating these products from the published literature, and the difficulties which have been encountered with these products in terms of proper release rates and clinical effectiveness. The student must be made aware of these factors if he is going to adequately advise physicians and patrons in this area.

The chapter on calculated solutions is unduly elementary for a senior student. The material in this chapter properly belongs in the arithmetic course given in the first years of the pharmacy curriculum. Similarly, in the chapter on radioactive pharmaceuticals, senior students don't need to be told that an atom is composed of a nucleus of protons and neutrons surrounded by orbiting electrons. Certainly the reader should be informed of the activities of pharmacists in handling radioactive pharmaceuticals, the necessary equipment, and how the agents are used. Problems of storage and assay are also important, as are the mathematics of radioactive decay.

Although the authors attempt to excuse the lack of references, such an omission is a serious drawback in any text. The purpose of references is not only to aid in the instruction of the student, but also to credit the investigator whose works are used in the text.

Pharmaceutical education is in dire need of a text in dispensing pharmacy which clearly demonstrates the application of basic disciplines to community and hospital practice. Many of these disciplines are being adequately taught, but their application is not. This text does not fulfill the expectations embodied in its title.

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*Methods of Vitamin Assay.* 3rd ed. Edited by The Association of Vitamin Chemists, Inc., Methods Committee. John Wiley & Sons, Inc., 605 Third Ave., New York, N. Y. 10016, 1966. xvii + 424 pp. 15.5 × 23.5 cm. Price \$14.00.

Probably the technology of vitamin assay has grown too complex in the last 15 years to get it all into a single book. Thus, the Third Edition of "Methods of Vitamin Assay" tries to cover so much ground in food and feed applications that it is not likely to be very useful as a laboratory manual to analysts in the pharmaceutical field. The style and quality of the work varies from one chapter to another because of the multiple authorship. The chapters on sampling and biological assays are good, although not particularly slanted to pharmaceutical analysts. The one on vitamin D is excellent.

My confidence was shaken somewhat by the repetition in the vitamin A chapter of statements from the Second Edition that are no longer applicable today. The authors seem unaware that changes have been made in the U.S.P. Reference Standard, monograph, and assay method since 1951. The only serious defect in the chapter though is that the calculation for the ultraviolet absorption method

will give results about 6% higher than the one adopted by the U.S.P. in 1958. While this could be an isolated oversight, it casts doubt on the thoroughness of the preparation of the Third Edition and on the authenticity that the book might be assumed to have—particularly for pharmaceutical analysts.

The chapter on vitamin E fails to mention any official method, and the one given for pharmaceuticals differs from those in the N.F. and U.S.P. The chapter concerns itself mostly with food and feed applications. Even so, it covers so many methods in so many applications that it is lacking in detail.

The chapters on the other vitamins are about equally divided as to whether they take cognizance of an official method.

This edition could be of value to pharmaceutical analysts as a guide to the many modifications that are possible for specific problems. However, it should be supported by reference to official methods, where they are applicable, and to the original literature, where more complete detail is usually given.

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*Chemical Principles in Calculations of Ionic Equilibria.* By EMIL J. MARGOLIS. The Macmillan Co., 866 Third Ave., New York, N. Y. 10022, 1966. xi + 482 pp. 15.5 × 24 cm. Price \$7.95 cloth-bound; \$3.95 paperbound.

Although teachers of physical pharmacy and pharmaceutical analysis can assume that their students have been exposed to the principles and calculations of ionic equilibria, review and expansion of the subject matter are usually desirable and necessary. This book can be recommended for that purpose as either a source of self study assignments or for class room use.

The first chapter reviews in a classical fashion simple mathematical operations. Chapter 2 defines components and units of concentration. Each of the remaining six chapters is divided into three sections: a discussion of theoretical principles; a collection of appropriate interpretative problems with solutions; an extensive collection of supplementary problems. Chapter 3 deals with protolytic equilibria and complex-ion formation. Included are treatments of the hydrolysis of salts, buffers, ionization of polyprotic acids, titration curves, and indicator selection. Brønsted-Lowry concepts are used in the discussion of hydrolysis and ionization. Approximate equations, used for the calculation of species distribution and concentration are derived. Although exact equations are not presented, limitations of the approximate equations are discussed. Here, as with the remaining chapters, interpretative exercises are presented to cover a wide range of situations. Step-wise solutions of the problems are given with extensive helpful commentary on both the chemical and mathematical aspects of the situation. Solid-liquid precipitations and solubilizations are the topics of chapter 4. Emphasis here is placed on the application of  $K_{sp}$  principles to inorganic qualitative analysis. Of particular interest is the treatment of simultaneously occurring equilibria as for example the solubilization of weak acids, bases, and ampholytes by pH adjustment or complex formation.

Liquid-liquid partitioning behavior and extraction are briefly reviewed in chapter 5. Chapter 6 covers, in an elementary manner, activities, activity coefficients, ionic strength, and the Debye-Hückel equation. The interpretative problems provide useful and illuminating practical illustrations of activity considerations. Principles and applications of electrochemistry are reviewed in chapters 7 and 8. Voltaic and electrolytic cells are discussed and illustrated, standard electrodes are defined and explained. A descriptive elementary treatment of free energy, enthalpy, and entropy is presented as a prelude to the introduction of the Nernst equation. Potential diagrams, redox titrations, and redox indicators are also covered.

In general, the book covers principles and calculations at a level somewhat higher than the usual general chemistry treatment. The author's long experience as a teacher in the area is reflected by his anticipating and emphasizing aspects of ionic equilibria which are usually poorly understood by the average student.

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*Applied Infrared Spectroscopy.* Edited by DAVID N. KENDALL. Reinhold Publishing Corp., New York, N. Y. 10022, 1966. xv + 560 pp. 15.5 × 23.5 cm. Price \$23.

The 18 chapters of this volume provide a survey of the state of the art of infrared spectroscopy. Applications are described in eight of the chapters. These include descriptions of the use of infrared spectrometry by organic chemists at the bench and for studies on polymers, inorganics, the structure of coal, and essential oils and related products. Expositions on the use of infrared in the industrial laboratory, in pharmaceutical research and development, and in government regulatory agencies are provided. Techniques are covered in the remaining chapters, which include an introduction to infrared theory, practical hints on technique, a description of instrumentation, general and microsample handling techniques, microtechniques using miniaturized diamond optics, a scheme for qualitative interpretation of spectra, and chapters on attenuated total reflectance and the use of computers in spectroscopy.

Since the book is the product of a collaboration among 21 authors and co-authors, it is not unexpected that the chapters are uneven in quality and that there is considerable overlap in material covered. Detailed descriptions of the use of Beer's law in quantitative analysis are given in chapter 2, "Survey of Practical Information," chapter 6, "Infrared on the Chemist's Bench," and chapter 8, "Application of Infrared Spectroscopy to Polymers." Similarly, a description of the literature and spectra collections available is provided in three of the chapters. The relative lack of cross-referencing among the chapters is wasteful of space; however, there is a didactic advantage in having each chapter complete in itself.

Chapters on "Infrared in the Regulatory Agencies" by Carol and Hayden of FDA and "Pharmaceutical Applications of Infrared Spectroscopy" by Johnson, Rinehart, and Graham are of most immediate interest to pharmaceutical scientists, but notable also are the fascinating chapter on "The Use of Computers in Spectroscopy" by Savitzky and