Media Reviews

General Chemistry with Qualitative Analysis, 6th edition. By Kenneth W. Whitten, Raymond E. Davis, and M. Larry Peck, Saunders College Publishing. ISBN 0030212170, (September 1999), £25.95. Available through Harcourt International.

General Chemistry with Qualitative Analysis is a colorful textbook with the high degree of readability that is important for maintaining the undergraduate student's interest. The textbook is designed for students in a first-year (freshman) introductory chemistry course.

As one might expect, the presentation has features in common with a number of other Introductory Chemistry textbooks. Many of the images in *General Chemistry* can be found in a similar format in other texts. However, the treatment of topics does not always mirror that found elsewhere. For example, the authors have chosen to combine some topics, such as enthalpy, entropy, and Gibbs free energy, into one chapter on "Chemical Thermodynamics," although this subject is given two or more chapters in other books.

Molecular orbital theory is covered in a separate chapter that allows instructors the option of teaching it in an introductory course. Some instructors will argue (perhaps correctly) that this theory may be more appropriate in an upper-level chemistry course. A certain level of entertainment is also achieved in "Chemistry in Use" boxes as well as in the margin notes. Some of this information may appear trivial, but these boxes do illustrate interesting chemical properties and provide historical information without distracting the reader.

In its sixth edition, this textbook has a polished look, with few typos. A useful table of constants is easily located on the back cover. An additional table indicating the location of commonly used information is also positioned on the back cover, but it does not really enhance the well-organized index and seems to be repetitive.

One feature that is unique among introductory chemistry textbooks is the section devoted to qualitative analysis. This is ideal for science students as an introduction to more advanced chemistry courses such as analytical or inorganic chemistry courses. Although presented as a separate section, the eight chapters of qualitative analysis comprise less than 100 pages, so the emphasis on qualitative analysis is not as great as the book's title might suggest.

Perhaps the strength of this textbook is the problem-solving approach it uses to illustrate basic chemistry to the first-year student. This is particularly useful for illustrating concepts such as Lewis structures, equilibrium, kinetics, and thermodynamics, to name only a few. The solved problems within each chapter are clear and will be useful to the student. There are also "problem-solving tip" boxes within each chapter. Students will find these highlighted tips to be quite helpful (e.g., "When Do We Round" on p 62, and "Solving Quadratic Equations" on p 720).

Both students and instructors will welcome the large selection of sample problems provided at the end of each chapter. A good selection of problems is essential for instructors and students because one of the best ways to teach and learn introductory chemistry is through a problem-solving model. Though not a serious criticism, answers are provided for only selected even-numbered problems. Students should therefore purchase the study guide to fully benefit from the problems at the end of each chapter.

Of interest to students is the stereo artwork (and stereoglasses) provided with the textbook. Students who may have difficulty visualizing molecular shapes will find this tool quite useful. It should be noted that most chapters do not take advantage of this tool, so it may not seem worthwhile if you are not teaching coordination compounds (Chapter 25) and biopolymers (Chapter 28) in an introductory course.

A nice addition is the Saunders Interactive Software. Although the software repeats much of the written material in the textbook, additional images and the short movies will enhance the first-year student's view of chemistry (e.g., standing waves). It should be noted that software will work best on newer computers; students with older machines may have trouble. Of course, having a Website and software associated with the textbook can only help the student, and if present trends continue, the personal computer will play an ever-increasing role in education.

Overall, this is an excellent book for teaching introductory chemistry; it deals with all of the essential topics in depth, and devotes sufficient space to problem solving.

Doug Goltz, University of Winnipeg
dgoltz@uwinnipeg.ca

S1430-4171(00)06435-5, 10.1007/s00897000435a

The Chemistry of Fireworks. By Michael S. Russell. Royal Society of Chemistry, Science Park, Milton Road, Cambridge, UK. March 2000. xviii + 118 pp. 216 x 138 mm. £18.95. ISBN 0 85404 598 8.

The output of books providing accurate scientific details on pyrotechnics has slowed greatly during the past five years. While good texts on this subject are still available, new additions to this literature have been rare and there has been an increasing emphasis on reprinting some of the classic texts on fireworks. Now Michael S. Russell adds another treatise on the chemistry involved in the composition of display fireworks.

The publication of *The Chemistry of Fireworks* is a welcome addition as a primer to the chemistry of pyrotechnics. While this book was written for the student with an A-level qualification or equivalent in chemistry, it has potential for use in a college-level general chemistry course. (The British "A level" equates to Advanced Placement coursework at the high-school level in the United States.)

In twelve chapters, Russell covers the basic devices used in fireworks and concludes with a consideration of pyrotechnic safety and British regulations and standards. Chapter 1 includes a seven-page glossary of pyrotechnic terms designed to help those reading pyrotechnic literature for the first time. Some of the definitions are quite brief and do not completely explain some key terms. *Stars* are defined simply as "a compressed pellet of explosive composition designed to be projected as a pyrotechnic unit." This excludes two of several other major forms of stars, including the rolled and cut styles. This reviewer found the glossary helpful in "translating" some of the British terms for fireworks; terminology is not always the same. For example: the U.S. pyrotechnician would know the *Burster* as the *burst charge* or *composition*, the British

term for the *lift charge* is the *propellant,* and the U.S. terms *Quickmatch* and *Black Match* are called *Piped Match* and *Quickmatch* respectively in Britain.

Chapter 1, "Historical Introduction," is a nine-page condensation of the history of black powder. While this survey focuses on the development of black powder in Britain, Russell does cover the key events in international history and gives the reader a chronologic time frame to see how this compound has progressed. He starts with the Chinese and the Arabs as the discoverers of black powder and continues through Roger Bacon's work, ending with modern-day knowledge.

Chapter 2, "The Characteristic of Black Powder," is a concise yet sufficient account of the basic dynamics of black powder. Russell includes the influences of composition, density, moisture, and stoichiometry. This chapter could be used in the practical application of teaching such basic principles of chemistry as the heat of reaction, enthalpy change, stoichiometry, and activation energies, as applied to ignition temperatures.

Chapter 3, "Rockets," invokes the science of physics and chemistry in the description of the basics of rocketry. This ten-page chapter provides an introductory view of the key principles including propellants, ballistics (both internal and external), and influences on rocket design.

Chapter 4, "Mines and Shells," deals with the two major devices used in modern display fireworks. Once again, internal and external ballistics are discussed. Russell again uses the European system to describe shell diameter in millimeters, in contrast to the U.S. practice of describing shell and mortar dimensions in inches. He describes the current trend toward using plastic hemispheres to construct ball-type shells. While plastic has grown in popularity, he refers to a type of plastic shell with lift included that is rather outdated and not currently seen in the U.S. The author introduces mines, but gives little description of how they are constructed compared to aerial shells.

Chapter 5, "Fountains," not only describes how fountains are constructed, but also introduces the reader to atomic and quantum theory. This information provides the background knowledge required for a brief discussion of how different colors are produced in fountains and other fireworks. His descriptions are adequate for this level of book, but the discussion spreads from this chapter into those that follow.

He writes about "Sparklers" in Chapter 6, "Bangers" in Chapter 7, and then in Chapter 8, "Roman Candles" completes his explanation of how the main colors of fireworks are produced. This dispersal of the discussion over several chapters does not help the newcomer to pyrotechnics apply the theory to current applications. I would recommend that this subject be discussed in a single chapter, rather than spread among several. These chapters do, however, provide the novice with a clear indication of how these fireworks perform.

He divides the discussion of color by giving the standard information on green and red stars, while leaving discussion of blue stars to later in the book. Blue stars are the most challenging to understand and are also the hardest to make with consistent color. Blue-producing compositions are discussed two chapters later in Chapter 10, "Special Effects," which describes how different color lance materials, including blue, are formulated. The author does an ample job of handling the current understanding of how blues are produced in flames of the pyrotechnic materials' combustion. The color of these flames is discussed in full some five chapters after this subject is introduced. Consolidating this discussion of color would strengthen the text and afford a more systematic and cohesive understanding of this key topic.

Chapter 9, "Gerbs and Wheels," provides a good description of these interesting and entertaining historic devices of fireworks. Chapter 11, "Fireworks Safety" and Chapter 12, "Fireworks Legislation" help the reader grasp how important safety and following the regulations are to properly and legally displaying fireworks.

This book would make a good supplemental textbook to a high-school A.P. chemistry or college general chemistry course. The fundamental principles of chemistry can be effectively illustrated through their application in pyrotechnics, and this textbook provides some of that correlation. Some errors remain. For example, in Chapter 2, Equations 2.9 and 2.10 set *k,* the rate constant for a reaction, equal to *t,* the time until ignition. The rate constant will increase with a temperature rise, whereas the time to ignition must decrease. Perhaps this was a transposed equation that could be easily corrected in a future printing. While this volume can be improved, it does offer a starting point for the beginning student of pyrotechnics and chemistry.

Paul E. Smith, Purdue University
psmith4@purdue.edu

S1430-4171(00)06436-4, 10.1007/s00897000436a

Review of R.G. Mortimer's *Physical Chemistry,* 2nd Edition. Robert G. Mortimer, *Physical Chemistry,* 2nd edition; Academic Press: San Diego, 2000. ISBN 0-12-508345-9. 1116 pp. £32.95, $79.95.

There is no shortage of undergraduate physical chemistry textbooks. Nearly all cover very similar material, and they can often be distinguished only by the style of presentation—there are, after all, only so many ways of defining standard physical chemistry concepts. This book, being a second edition of a popular tome, is typical of the genre. It is divided into a number of sections, the major ones are thermodynamics, kinetics, and quantum mechanics. So, is there any good reason to recommend this, as opposed to any of the other physical chemistry textbooks, as a compulsory purchase for students?

With regard to subject matter, this is a very thorough physical chemistry text. Following a brief introductory chapter that gives the terms of reference and some basic definitions, there are eight chapters on thermodynamics, including the First, Second, and Third Laws, as well as phase equilibria, and chemical and electrical systems. A further four chapters are devoted to kinetics. Another large section of seven chapters deals with quantum mechanics, from its principles through to the electronic states of atoms and various states of molecules that are useful for spectroscopy. The book is completed by chapters on statistical mechanics, structures of solids and liquids, and theories of nonequilibrium processes.

Within this edition there are many favorite subject areas covered that I teach and many that I don't teach. (Personally, I leave the teaching of quantum mechanics to others!) Subjects that are not discussed include solubility, partitioning behavior into immiscible systems, and the measurement of viscosity, etc., but it should be noted that I miss these only because they are personal to my teaching in pharmaceutical-based courses.

Thus, Mortimer will serve as an extremely thorough physical chemical reference for chemistry undergraduates. However, some aspects of this book do make it intimidating. It is very mathematical, many of the derivations are probably beyond the level and comprehension of most of today's chemistry undergraduates. To make matters worse, the most "important," or finished, equations are heavily highlighted, which immediately draws the eye to them.

To my mind this is a reference book for those students in "pure chemistry" programs. The very nature of the book, with its heavy reliance on mathematical derivation rather than textual explanation, would be off-putting to students in more-applied courses, such as those in the pharmaceutical sciences (my own area of interest). Clearly, writing an applied textbook was not the intention of the author, but we should not put off "weaker" students by forgetting that chemistry is an applied science. For instance, section 8.7 illustrates chemical reactions and biological systems by reference to the thermodynamics of ATP reactions (an excellent example). It is a shame that biological examples could not be used to illustrate other chemical processes.

Some pleasing aspects of the book include the fashionable (learning) objectives at the start of each chapter (academics the world over will be able to incorporate these into their learning materials). There is also at the start of each chapter a brief, numbered list of the principal facts and ideas to be presented. A summary is included at the end of each chapter that, more or less, reinforces the list at the start. There are several worked examples throughout the text. In addition, each chapter is supplemented by numerous exercises within the text and problems at the end. Again, these reinforce the information, and answers are provided at the end of the book. As is usual however, only the answers are supplied, not the full calculations, which may leave students (and lecturer!) bemused if they do not obtain the correct answer.

As a teaching aid, I would only be able to use this as a reference source. This would provide a very dry series of lectures, mainly based around the derivation of equation after equation without any illustrations or applications of the pure science. Also, modern educators in this field require more than a textbook on which to base their lectures. Typically, the teacher requires information either directly on overhead projector slides or downloadable into, for instance, a Microsoft PowerPoint file. Neither of these appear to be an option. Making slides of the derivations of equations would be an onerous task. Despite this, the pressed-for-time lecturer could easily use some of the copious problems and examples as the basis for coursework and examination material.

The book is well-presented and the typesetting seems to be of high quality. The textbook is generally in black and white, although red is used in the small number of diagrams (there are no pictures) and to highlight important points. There is a pleasing number of anecdotal comments in the margin area. Some of these are factual, with limited biographical details of the more eminent chemists, along with other useful learning tools (e.g., anode relates to oxidation as they both begin with vowels; whereas cathode and reduction begin with consonants). It is a shame there are not even more of these! Such anecdotal fripperies would serve to lighten the book and make it, and the science, more approachable.

So to the question of whether Mortimer's *Physical Chemistry* should become a compulsory purchase for students. This is a good, solid (literally) reference textbook. At over 1100 pages, with 23 chapters plus appendices, and securely hardbound, it certainly represents good value at £32.95. Its sheer bulk means, however, that it is not a book a student would willingly carry to college as an everyday reference source! We need to keep in mind though, as we enter the new millennium and have now unraveled the human genome, teaching theoretical chemistry, some of which dates back over 200 years, will be increasingly difficult and unpopular with students. This is an excellent source of reference; however, it will leave students with any inclination to apply chemistry rather disappointed. Because of these facts this book is only likely to be a useful compulsory purchase for the "purest" and most theoretical of chemistry courses.

Mark Cronin, Liverpool John Moores University
M.T.Cronin@livjm.ac.uk

S1430-4171(00)06437-3, 10.1007/s00897000437a