

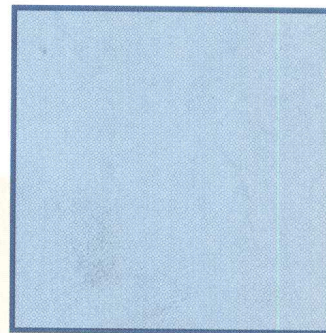
C O N C E P T S A N D
CHEMISTRY
C O N N E C T I O N S



C H A R L E S H. C O R W I N

Charles H. Corwin

American River College



Chemistry

Concepts and Connections



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Preface

Over the last 20 years, I have taught introductory chemistry to thousands of students. After much reflection, I have concluded that perhaps the most important variable in the learning process is positive reinforcement. I have found that it is in the best interest of students and teachers alike if instruction takes place in an environment that builds confidence and gives encouragement. It is my experience that students are more willing to put forth their best effort if given an expectation of success. In an atmosphere of optimism, students are more willing to accept the burden of learning, for which they must ultimately assume responsibility.

To this end, the tone of this text is friendly, affirmative, and inclusive. The text is especially sensitive to the needs of students who require review in some basic academic skills. The level of difficulty is gradual and progressive, and there are no math/chemistry skills taken for granted. To help students focus on a topic, a brief set of objectives introduces each chapter section. For emphasis, there are numerous example exercises, and there is frequent repetition of important points.

A primary concern of this text has been to generate and maintain student motivation. This concern has been addressed in a number of ways. Full-color photographs and line art are generously distributed throughout the book. In addition, the text emphasizes real-world applications of chemistry that help students relate the subject to their own lives.



Features

There are numerous key features that include the following:

Problem Solving. All problems involving calculations are solved systematically in three steps using the unit-analysis method. The unit analysis method of problem solving is first introduced in Chapter 1 and is then reinforced in Chapter 2. In the chapters that follow, unit analysis is applied to mole problems, stoichiometry, and solution calculations.

The use of algebra in solving problems is strictly optional. In selected instances, problem solving using an algebraic method is provided as an alternate solution. In Chapter 12, for example, gas law calculations are solved algebraically as well as by a modified unit analysis approach.

Recognizing that students require practice in order to learn to solve problems, there are 300 example exercises in the text, each paired with a self-test exercise. In addition, there are over 1600 end-of-chapter exercises arranged in a matched-pair format. Answers are provided for all of the odd-numbered exercises in Appendix J. Answers are found to the even-numbered exercises in the *Instructor's Resource Manual*.

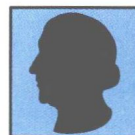
Chemistry Connections. One of the ways that students are kept motivated and involved in the subject is through the inclusion of relevant vignettes on chemistry. These vignettes are entitled *Chemistry Connections* and range in subject matter from consumer to applied chemistry, and from historical biographies to environmental concerns.



Consumer



Applied



Historical



Environmental



Updates. Although introductory chemistry is more static than dynamic, there have been recent developments. For example, new elements have been synthesized, new group designations for the periodic table have been proposed, and there have been changes regarding systematic nomenclature. Special features called *Updates* discuss the latest developments.



Notes. One of the most difficult tasks of a textbook is to simplify explanations without overgeneralizing. To provide discussions free of interruption, a special note appears after many of the topics. This note qualifies any simplifications that may create a misimpression.

Conceptually Accurate Line Art. To help students conceptualize the atomic and subatomic levels, the text uses a magnification technique. For example, the individual molecules in an ice crystal are illustrated in Figure 3.3 and the atomic nucleus is portrayed in Figure 4.8.

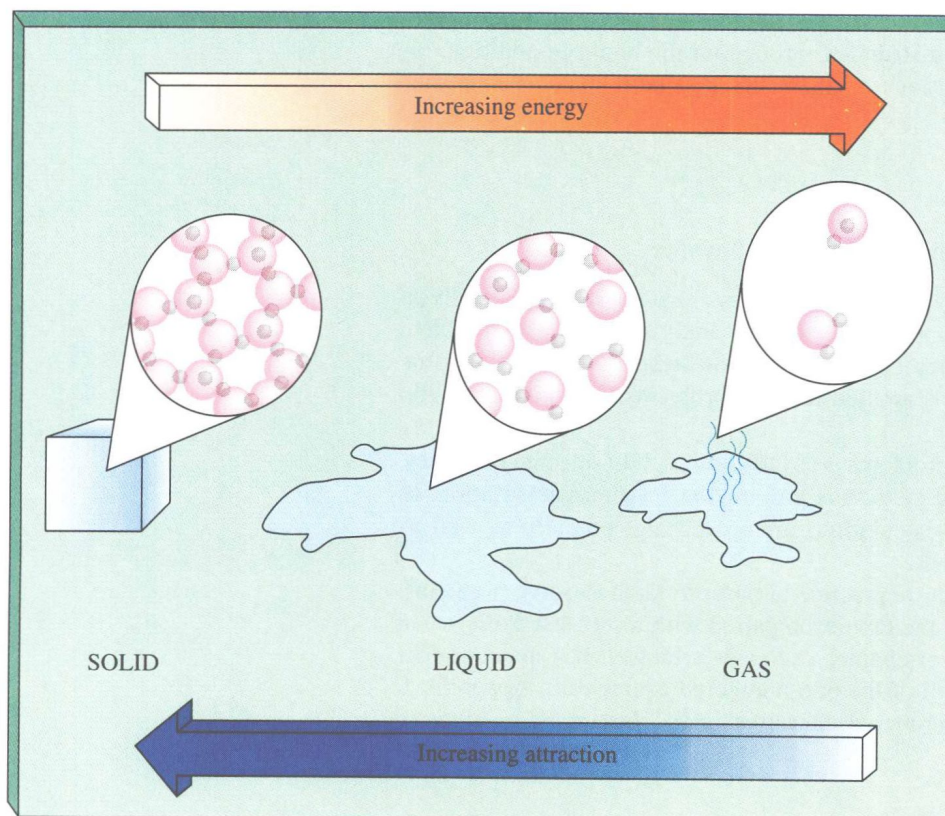


Figure 3.3

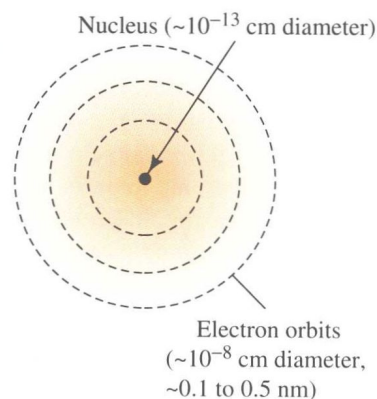


Figure 4.8

Concept Maps. To give students an overview of complex relationships, concept maps are used. A concept map is a diagram that illustrates how different aspects of a topic are related. For example, Figure 7.4 shows how the mole concept is related to Avogadro's number, molar mass, and molar volume.

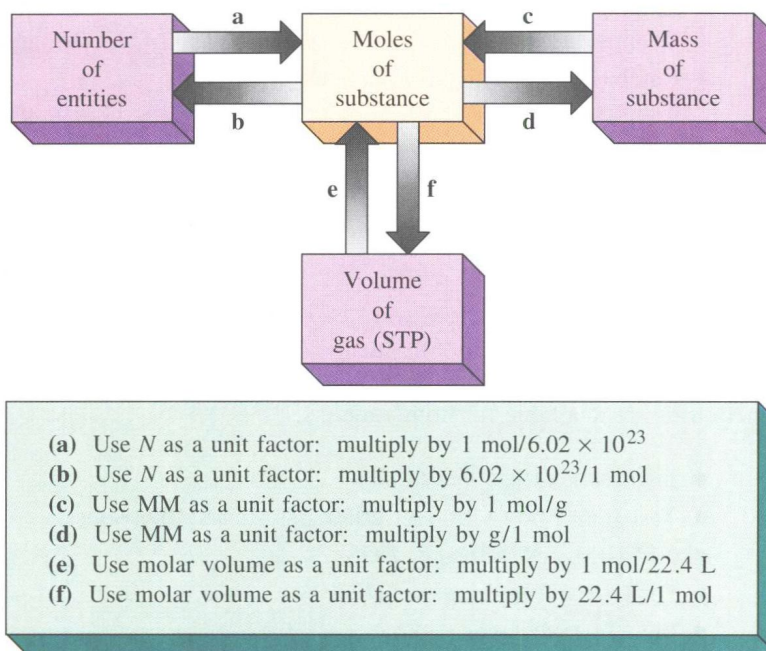


Figure 7.4

Glossaries. All key terms appear in bold type in the text where they are first introduced, and a running glossary also appears in the accompanying margin. For reference, there is comprehensive glossary at the end of the text. There is also a matching key-term exercise at the end of each chapter.

Summaries. A chapter summary reviews important topics and provides a capsule view of each section.

Full-color Production. The primary use of color is to highlight important points and make the presentation more inviting. A secondary use of color is to convey relationships in a more subtle way. For example, elements, energy levels, and orbitals are consistently color-keyed in the art throughout the text. Another example of the functional use of color is the blue vertical page border that appears on pages of the end-of-chapter exercises. The blue border enables students to locate these sections easily.

Organization

This text maintains a traditional organization of topics for introductory chemistry. Recently, a national survey of chemistry teachers indicated that most professors prefer that a discussion of atomic orbitals and chemical bonding be delayed until later chapters. That preference is reflected herein. The Bohr atom concept is presented in Chapter 4, while the discussion of atomic orbitals is postponed until Chapter 10, and chemical bonding to Chapter 11. However, the flexible design of the text allows the experienced teacher to cover these topics earlier in the course at their discretion.

This book possesses an unusual degree of flexibility resulting from its early

module development. Originally, each topic was assigned to a level in a hierarchy based on prerequisite topics. The initial premise was that the text should be sufficiently flexible to accommodate the objectives of different courses and preferences of various professors. A few of the possible chapter configurations are as follows.

- Emphasis on *Chemical Calculations*:
Chapters 1, 2, 3, 4, 5, 6, 7, 12, 8, 9, 11, 13, 14, 15, 16, and 18.
- Emphasis on *Chemical Reactions*:
Chapters 3, 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, and 17.
- Emphasis on *Atomic and Molecular Structure*:
Chapters 1, 2, 3, 4, 5, 10, 11, 6, 7, 8, 9, 12, 13, 14, 15, and 19.

Supplements

An alternate version of *Chemistry: Concepts and Connections* is available in a softcover edition. This edition is identical to the first 18 chapters of the hardcover edition and is intended for courses with restricted topic coverage. The following ancillaries are available for both versions.

- Instructor's Resource Manual
- Test Item File (with over 2000 class-tested questions)
- 3.5" IBM Test Manager DOS
- 5.25" IBM Test Manager DOS
- Mac Test Manager
- Laboratory Experiments
- I/M to Laboratory Experiments
- Student Study Guide
- Student Solutions Manual
- 120 Full-color Transparencies
- "How to Study Chemistry"
- *New York Times* Contemporary View Program

To assure that the teaching package is fully integrated, the author has personally written the *Instructor's Resource Manual*, *Test Item File*, and *Laboratory Manual*. The *Student Study Guide* and *Student Solutions Manual* were written in collaboration with Donald Lucas. Donald is an experienced chemistry tutor who has been selected for the AACJC Beacon Learning Project that is assessing peer-assisted instruction for at-risk students in math and science.

Acknowledgments

It is my pleasure to recognize several talented people who, directly or indirectly, were responsible for this project. First, it is my privilege to have outstanding colleagues, and I would be quite remiss not to mention each of the following: Ronald Backus, Nini Cardoza, James Cress, Sheila Epler, Melissa Green, Ronald Greider, Jim Morgan, John Newey, Luther Nolen, Karen Pesis, Nancy Reitz, Rina Roy, Michael Scott, Ronald Smedberg, Danny White, and Linda Zarzana. I am privileged to have Stephen Ruis for a friend and colleague as he has often served as an intellectual "sounding board." Steve is a dedicated teacher and frequently reviews

textbooks in the subject area. Over a summer's vacation, Steve and I met daily and argued many issues including the hierarchy of concepts and the subtle implication of key terms. Our give-and-take sessions ultimately led to a better integration of topics and a more precise use of language.

I would like to thank Harriet Serenkin, developmental editor, who gave me much to ponder in her numerous queries, offered moral support, and drafted the environmental *Chemistry Connections*. I am equally appreciative for a refreshing stay in New York City hosted by Harriet and her husband, Patrick. I am also indebted to Bill Thomas, copy editor, for his advice and for his incredible ability to spot even the most minor inconsistency.

During peer review, I received many valuable insights. Beyond pointing out my oversights, these reviewers helped define that vague line between the simplifications that students require and the explanations that accuracy demands. Considerate and thoughtful comments were received from each of the following.

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time to understand the project from conception to completion before formulating an enthusiastic marketing plan. Ray Mullaney, Editor-In-Chief of College Development, afforded a seasoned and cohesive presence that was a resource for us all. To each of these people, singly and collectively, I extend my sincere appreciation.

Charles H. Corwin

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Concepts and
Connections

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