

Raymond Chang

CHEMISTRY

Second Edition



Chemistry

Second Edition

Raymond Chang

Williams College



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Second Edition

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Preface

This text is for students taking a full-year general chemistry course. In both the first and second editions my aim has been to present chemistry in a manner that is understandable, interesting, and meaningful to the beginning student. I have tried to strike a balance between theory and application, and whenever possible, to illustrate the basic principles with everyday examples. No previous knowledge of chemistry has been assumed and calculus is not required.

This edition represents a thorough revision of the first edition. Some of the important changes are as follows:

- Gases are now discussed earlier, in Chapter 4.
- Chemical bonding is treated in two consecutive chapters (Chapters 7 and 8).
- Thermochemistry is explained in a separate chapter (Chapter 9).
- Acids and bases are discussed in two consecutive chapters (Chapters 15 and 16).
- Organic chemistry has been moved toward the back of the book (Chapter 24), just before biochemistry.
- Every major topic is fully integrated within the chapter and related to the materials presented in the other chapters.
- Many new worked examples and end-of-chapter problems have been added to each chapter.

The chapters of this edition flow logically and directly in a sequence that nevertheless allows for flexibility of class assignments. Inorganic nomenclature is introduced early, in Chapter 2, and stoichiometry is discussed in Chapter 3 to coordinate with laboratory work. Following a discussion of the gaseous state are two chapters on the electronic structure of atoms and periodic relationships. The first of the two chapters on bonding (Chapter 7) presents an elementary treatment of ionic and covalent bonding, and the second (Chapter 8) concentrates on molecular structure and modern theories of covalent bonding. Energy changes in chemical reactions are discussed in Chapter 9. Chapter 10 emphasizes the effects of intermolecular forces on the properties of liquids and solids. The following chapter discusses the physical properties of solutions. An important type of chemical reactions, oxidation–reduction reactions, is the subject of Chapter 12.

As a group, Chapters 13–19 deal with the more quantitative aspects of chemistry. In the study of chemistry it is sometimes necessary to consider abstract topics, such as thermodynamics. Every effort has been made to present these concepts correctly and at a level that the beginning student can understand. Chapters 20–23 are given over to inorganic descriptive chemistry, and Chapters 24 and 25 describe the organic and biological worlds. These chapters bring together many of the principles and facts

learned earlier in the text. The last chapter, nuclear chemistry, can be covered much earlier in the course.

One of the joys of learning chemistry is seeing how chemical principles can be applied to everyday experience. The favorable comments received about the Chemistry in Action sections in the first edition indicated that both students and instructors find this an attractive feature. In this edition I have added several new ones and dropped the less appropriate ones. Some examples of topics discussed in Chemistry in Action sections are chemical fertilizers, the third liquid, how a bombardier beetle defends itself, recycling aluminum, and dental filling discomfort.

Every important term appears in boldface type where it is introduced and defined. For quick reference, these key words are also listed alphabetically and defined in a glossary at the end of the book. There is a summary at the end of each chapter to serve as a review of the important concepts introduced in the chapter. To provide the student with some knowledge of the individuals involved in the development of chemistry, a brief biographical sketch is given for almost all of the scientists mentioned in the book. In addition to the standard appendixes that follow Chapter 26, several chapters contain short chapter appendixes, which provide additional information and extend the chapter discussions.

The best way to test one's understanding of chemical concepts is by solving problems. The many worked examples within each chapter demonstrate problem-solving techniques. In addition, there are over 1400 end-of-chapter problems. These problems are grouped according to chapter sections. Problems marked with an asterisk are more challenging than the unmarked ones. Answers to all numerical problems are provided at the end of the book.

Most of the units used in this book are SI units. For practical laboratory reasons, I have retained the use of atmosphere and mm Hg for pressure and liter and milliliter for volume.

Supplements available for use with this text are:

- Kenneth W. Watkins, *Study Guide*
- Raymond Chang, *Solutions Manual*

These supplements contain many ideas and insights that are helpful to understanding chemical concepts, as well as problem-solving techniques. An instructor's manual, written by the author, is available upon request from the publisher.

I would greatly appreciate your comments and suggestions.

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