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INSTRUCTOR'S RESOURCE MANUAL

TO ACCOMPANY

CHEMISTRY

THIRD EDITION

Olmsted & Williams

CONTENTS

INSTRUCTOR'S RESOURCE MANUAL

Overview

Chemistry, 3/e is structured to provide a solid grounding in fundamental concepts of chemistry. Topics covered are relevant to students majoring in chemistry as well as those majoring in related disciplines such as biology, geology, physics, engineering, or the health sciences. Most of the general topics are familiar ones: stoichiometry, atomic structure, molecular structure and bonding, properties of gases and condensed phases, thermodynamics, rates of reactions, chemical equilibria, redox and electrochemistry. Because of their importance in contemporary chemistry, four less familiar major topics are highlighted: macromolecules, main group elements, transition metals, and nuclear and radiochemistry. The text is designed for a standard one-year chemistry course.

The concept of energy and its central role in chemistry is developed throughout the early chapters of the book. Conservation of energy and the forms of energy are introduced in Chapter 2, molecular kinetic energies are highlighted in Chapter 5, energy analysis is a major theme in Chapters 6 and 7, energetics of chemical bonding is woven throughout Chapters 8 and 9, and the energetics of intermolecular interactions underlie much of the discussion in Chapter 10. The quantitative analytic approach to thermodynamics is reserved for Chapters 12 and 13.

Chemistry, 3/e emphasizes the molecular nature of matter. Chemical behavior is examined from a molecular perspective. The text describes what molecules are doing, molecular behavior is used to rationalize physical and chemical properties, and molecular pictures are drawn. Thus, students will learn faster, enjoy their studies more, and achieve a deeper understanding by continually being immersed in the molecular view.

The text's presentation is concept-centered. Once students have completed a course in general chemistry, they will retain fundamental ideas, not specific details. Consequently, rote memorization is minimized and conceptual understanding that contains predictive value is maximized. Descriptive material is presented in the context of the development of chemical principles. Chemical facts are sprinkled throughout the text and the problems.

Problem-solving and the application of concepts are embedded in the subject of chemistry, not appended to it. The text reflects this. Sample problems are intended to be part of the flow of the chapter, to be read and understood as the text is read. Exercises at the end of each section are similarly designed to give immediate reinforcement of the concepts.

Chapter problems are divided into two sets, those identified by section and "additional problems" that are not classified by section. Many of the additional problems are no more difficult than those that are classified by section. Many unclassified problems are provided because in the real world (and in the student's "real world" of examinations) problems do not come equipped with section titles. A persistent difficulty for students is "figuring out what kind of problem it is," and the only way to master that skill is by practicing it. By not telling students which of the additional problems "go with" any particular section, they are challenged to become active learners and determine this for themselves.

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"Real-world"chemistry should be woven throughout any general chemistry course, and Chemistry, 3/e has industrial and everyday examples sprinkled throughout. Useful chemical facts appear in the text, in sample problems, in boxes, and in chapter problems. Boxes within the text are used to set off descriptive material that is highly interesting but is not required reading. Some boxes address matters of historical interest, such as Box 7-2 which discusses the history of the periodic table and Box 8-1 which describes the contributions of G. N. Lewis. Others provide additional details about applications in the real world. Box 4-1 describes the role of oxidizing agents in the paper industry and Box 9-2 describes applications of semiconducting materials. Many of the boxes illustrate the importance of chemistry to biological functions. Box 11-2 discusses the human genome project and DNA sequencing while Box 17-2 describes how biological systems use buffers to maintain the pH of blood. Environmental issues are also addressed. Box 5-2 discusses current trends in global climate and Box 20-2 describes the controversy over the industrial use of chlorine.

Additional material appears in the appendices. Appendix A, Scientific Notation, describes power-of ten manipulations and should be studied by students who have not yet learned these manipulations. Appendix B, Quantitative Observations, addresses precision. Rules for significant figures and rounding are simplified to allow students to get beyond the tyranny of significant figures and focus on chemistry. Appendix C, Ionization Energies and Electron Affinities of the First 36 Elements; Appendix D, Standard Thermodynamic Functions; Appendix E, Equilibrium Constants; and Appendix F, Standard Reduction Potentials, E°, contain numerical data for chemical properties that are commonly used in general chemistry. These compilations are sufficiently comprehensive that they can serve as ready references for instructors as well as students.