

PREFACE

CHEMISTRY AT THE CORE

Some years ago, a question occasionally heard was “Why study chemistry?”—but no longer. At the core of the natural sciences, chemistry is crucial to an understanding of molecular biology, genetics, pharmacology, ecology, atmospheric science, nuclear studies, materials science, and numerous other fields. Because chemistry is so central to understanding these fields, it is a core requirement for an increasing number of academic majors. Some major societal issues also have chemical principles at their core, including climate change, energy options, materials recycling, diet, nutrition, exercise, and traditional vs. alternative medicine. Clearly, the study of chemistry as an integral part of our world is essential.

To respond to numerous modern challenges, chemistry is evolving in new directions to design “greener” plastics and fuels, monitor atmosphere and oceans to model global warming, determine our genetic makeup to treat disease, and synthesize nanomaterials with revolutionary properties, among many others.

Nevertheless, as the applications change, the basic concepts of chemistry still form the essence of the course. The mass laws and the mole concept still apply to the amounts of substances involved in a reaction. Atomic properties, and the periodic trends and types of bonding derived from them, still determine molecular structure, which in turn still governs the forces between molecules and the resulting physical behavior of substances and mixtures. And the central concepts of kinetics, equilibrium, and thermodynamics still account for the dynamic aspects of chemical change.

The challenge for a modern text surveying this enormous field is to present the core concepts of chemistry clearly *and* show how they apply to current practice. The fifth edition of *Chemistry: The Molecular Nature of Matter and Change* has evolved in important ways to meet this challenge.

STILL SETTING THE STANDARD

Since its first edition, *Chemistry: The Molecular Nature of Matter and Change* has set—and continues to raise—the standard for general chemistry texts. While the content has been repeatedly updated to reflect chemistry’s new ideas and changing impact in the world, the mechanisms of the text—the teaching approaches that are so admired and emulated—have remained the same. Three hallmarks continue to make this text a market leader:

- **Visualizing Chemical Models—Macroscopic to Molecular**

Chemistry deals with observable changes caused by unobservable atomic-scale events, which means a size gap of

mind-boggling proportions must be understood. One of the text’s goals is consonant with that of so many instructors: to help the student visualize chemical events on the molecular scale. Thus, concepts are explained first at the macroscopic level and then from a molecular point of view, with groundbreaking illustrations always placed next to the discussion to bring the point home for today’s visually oriented students.

- **Thinking Logically to Solve Problems**

The problem-solving approach, based on the four-step method widely accepted by experts in science education, is introduced in Chapter 1 and employed *consistently* throughout the text. It encourages students to first plan a logical approach to a problem, and only then proceed to solve it mathematically. Each problem includes a check, which fosters the habit of assessing the reasonableness and magnitude of the answer. Finally, for practice and reinforcement, a similar follow-up problem is provided immediately, for which an abbreviated solution, not merely a numerical answer, is given at the end of the chapter. In this edition, solving problems and visualizing models have been integrated in a large number of molecular-scene problems in both worked examples and homework sets.

- **Applying Ideas to the Real World**

An understanding of modern chemistry influences attitudes about melting glaciers and global food supplies, while also explaining the spring in a running shoe and the display of a laptop screen. Today’s students may enter one of the emerging chemistry-related, hybrid fields—biomaterials science or planetary geochemistry, for example—and the text that introduces them to chemistry should point out the relevance of chemical concepts to such career directions. Chemical Connections, Tools of the Laboratory, Galleries, and margin notes are up-to-date pedagogic features that complement content of this application-rich text.

EMBRACING CHANGE: HOW WE EVALUATED YOUR NEEDS

Just as the applications of chemistry change, so do your needs in the classroom. Martin Silberberg and McGraw-Hill listened—and responded. They invited instructors like you from across the nation—with varying teaching styles, class sizes, and student backgrounds—to provide feedback through reviews, focus groups, and class testing. Many of the suggestions were incorporated into this revision, and they helped mold the new edition of *Chemistry: The Molecular Nature of Matter and Change*, resulting in new topic coverage, succinct and logical presentation, and expanded treatment in key areas.