Preface
To the Instructor

An Introduction to Chemistry is intended for use in beginning chemistry courses that have no chemistry prerequisite. It was written for students who want to prepare themselves for general college chemistry, for students seeking to satisfy a science requirement for graduation, and for students in health-related or other programs that require a one-semester introduction to general chemistry. No matter what your students' goals are, this book will help them to learn the basics of chemistry.

I have been teaching introductory chemistry courses for over 30 years, and for much of that time, I considered writing my own text. There were three reasons for deciding to actually do it. The first was that the existing textbooks struck me as disjointed. They read more like a list of skills to master than like a coherent story of the nature of chemistry. I thought it should be possible to organize the fundamentals of chemistry so that each would flow smoothly into the next, and I hope that you agree that this *atoms-first* version of my text meets this goal.

It is common for introductory chemistry textbooks to provide a simple introduction to the nature of atoms and the chemical elements early, leaving the more complete explanation of modern atomic theory until much later in the text. In a similar way, a brief description of chemical bonding and molecular structure is found early, followed several chapters later by a more complete explanation of these topics. Because this method allows an early introduction to chemical reactions, I took this approach when writing the *chemistry-first* version of my text, but many chemistry instructors believe that it is better to provide a more complete description of atoms, elements, and compounds before the introduction of chemical reactions. This version of my text has been designed for these instructors.

A more complete understanding of atomic theory, including the ability to write electron configurations, provides a better basis for understanding chemical bonding and structures of chemical compounds. Likewise, a more complete understanding of compounds helps students to gain a more sophisticated understanding of the changes that take place in chemical reactions. In this version of my text, chemical reactions are not introduced until students have been provided a firm foundational knowledge of the structure of atoms, elements, and chemical compounds.

The second reason for writing this text was the feeling that the existing textbooks did not do a very good job of developing students' ability to picture the particle nature of matter. Through text descriptions, detailed illustrations, and computer animations, I have put more emphasis than most textbooks on helping students to visualize the changes that take place at the particle level. Students too often view chemistry as a set of rules for manipulating numbers, symbols, and abbreviations, never really connecting these rules to a physical reality. They can balance equations and do chemical calculations, but they cannot answer questions about what is happening on the particle level when an acid reacts with a base. Thus, whenever appropriate, I enhance the standard topics covered in introductory chemistry with corresponding descriptions of events from the particles' "point of view."

All textbooks have computer-based tools that support them, but the final factor that led to the creation of this text and its supplements is that I learned to create computer-based tools myself, and it occurred to me that a package whose text and computer-based ancillaries were all produced by the same person would offer real benefits. The Web-based tools that accompany this text include animations, glossary quizzes for each chapter, tutorials to consolidate and enhance important skills, and Web pages that provide extra information. Because I have created both the tools and the text, I think you will find that they fit together seamlessly.

Read on for a more detailed discussion of how these changes have been incorporated into *An Introduction to Chemistry* and its supplements. Each innovation has been developed with the ultimate goal of making it easier for you to give your students a coherent understanding of chemistry, a positive attitude toward chemistry (and toward you and your course), and a solid foundation on which to build, should they decide to continue their chemistry studies.

More Logical Sequence of Topics

In many texts, early chapters ask the reader to classify substances as elements, compounds, or mixtures and to classify changes as chemical or physical. Do you find it difficult to describe compounds before your students have a clear understanding of atoms and elements? Do you find it hard to describe chemical changes before your students know about chemical bonds and chemical compounds?

In the first week of class, I used to ask my students to classify substances as elements, compounds, or mixtures. That required me to introduce the concept of element long before any significant discussion of atoms and to describe compounds without first presenting a clear depiction of elements. I was equally uncomfortable asking them to classify changes as chemical or physical changes before they had any clear definition of chemical bonds. Now I move smoothly from a general description of the particle nature of solids, liquids, and gases to a description of atoms and elements (Chapter 3). Modern atomic theory is described in Chapter 4, providing a much better basis for the description of chemical bonds and chemical compounds in Chapters 5 and 6. The more complete treatment of atomic theory, chemical bonds, and compounds forms the basis for a more complete understanding of the nature of solutions and the processes of chemical changes (Chapters 7, 8, and 9). The introductory discussions that felt so disjointed to me in the past now seem to follow a logical progression—a story, really—that flows from simple to more complex.

Emphasis on the Development of Visualization Skills

Do you ever worry that your students can write balanced chemical equations but do not have a clear mental image of the events that occur during a chemical reaction?

I think it is extremely important for students to develop the ability to visualize the models that chemists use for describing the structure and behavior of matter. I want them to be able to connect a chemical equation to a visual image of what is happening in the reaction. Throughout the text, I emphasize the development of a mental image of the structure of matter and the changes it undergoes. I start with a more comprehensive description of the kinetic molecular theory than is found in most

other books, and I build on that description in the sections on elements, compounds, and chemical changes. To help the student visualize structures and processes, I provide the colorful and detailed illustrations that are prominent in the book. Moreover, the book's Web site provides animations based on key illustrations.

Identification of Skills to Review

When your students have trouble with a task, do you ever think that it's because they have not completely mastered some of the lessons presented in earlier chapters?

The Review Skills section at the beginning of each chapter lists skills from earlier chapters that will be needed in the present chapter. The students can test their mastery of each skill by working the problems in the Review Questions section at the end of each chapter.

Instructors who wish to teach chapters in a different order than the one in the book can use these sections to identify topics that may require supplementation.

Sample Study Sheets

Are the best-organized students in your class often the most successful? Do you ever wish that the text you were using helped students get more organized?

In an introductory chemistry course, it really pays to be organized. This text helps students get organized by providing Sample Study Sheets for many of the tasks they will be expected to do on exams. Each study sheet describes how to recognize a specific kind of task ("Tip-off") and breaks the task down into general steps. Each Study Sheet is accompanied by at least one example.

Extensive Lists of Learning Objectives

Do your students ever complain that they do not know what they are supposed to be able to do after studying a chapter in the text?

The learning objectives listed at the end of each chapter are more comprehensive than the objectives in other texts. They list all the key skills taught within the chapter, thus helping students to focus on the most critical material. Objective references in the margins of the chapter denote the paragraphs that pertain to each objective, so that a student who has trouble with a particular objective can easily find the relevant text discussion. Many of the end-of-chapter problems are similarly referenced, so that students can see how each objective might be covered on an exam.

Chapter Glossaries and Glossary Quizzes

Do you wish your text did more to help students learn the language of chemistry?

Learning the language of science is an important goal of the courses for which this textbook is designed. Most books have a glossary at the back, but I suspect that students rarely refer to it. In addition to the glossary at the back of the book, this text also has a list of new terms at the end of each chapter, where it can serve as a chapter review. Glossary quizzes for each chapter can be found on the book's Web site.

More Real-World Examples

Do your students feel that what they read in their textbook is too far removed from the real world?

This text is full of real-world examples, both in the chapter narrative and in the problems. For example, after introducing the idea of limiting reactants, Section 10.2 explains why chemists design procedures for chemical reactions in such a way that some substances are limiting and others are in excess. Chapter 6 problems mention vitamins, cold medicines, throat lozenges, antacids, gemstones, asphalt roofing, fireworks, stain and rust removers, dental polishing agents, metal extraction from natural ores, explosives, mouthwashes, Alar on apples, nicotine, pesticides, heart drugs, Agent Orange, thalidomide, and more. The chemical reactions used in problems often represent actual industrial processes. Several of the Special Topics scattered throughout the book describe the achievements of "green chemistry."

Key Ideas Questions

Have you ever wondered whether the chapter reviews in many textbooks are useful to students?

After the Review Questions section at the end of the each chapter is a section titled Key Ideas. Students are given a list of numbers, words, and phases that they use to fill in the blanks in a series of statements that follows the list. The statements summarize the most important ideas from the chapter—that is, they add up to a chapter review. Because this review is a game of sorts, the students get more actively involved and more interested in recalling key ideas than they do when reading a chapter summary.

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If you have any questions about the text that you would like to ask me, I'd be happy to have the opportunity to answer them. Feel free to send me email at markbishop@chirlpublishing.com. I hope that your teaching experience using this book (or any other text) will be a satisfying and pleasurable one.

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