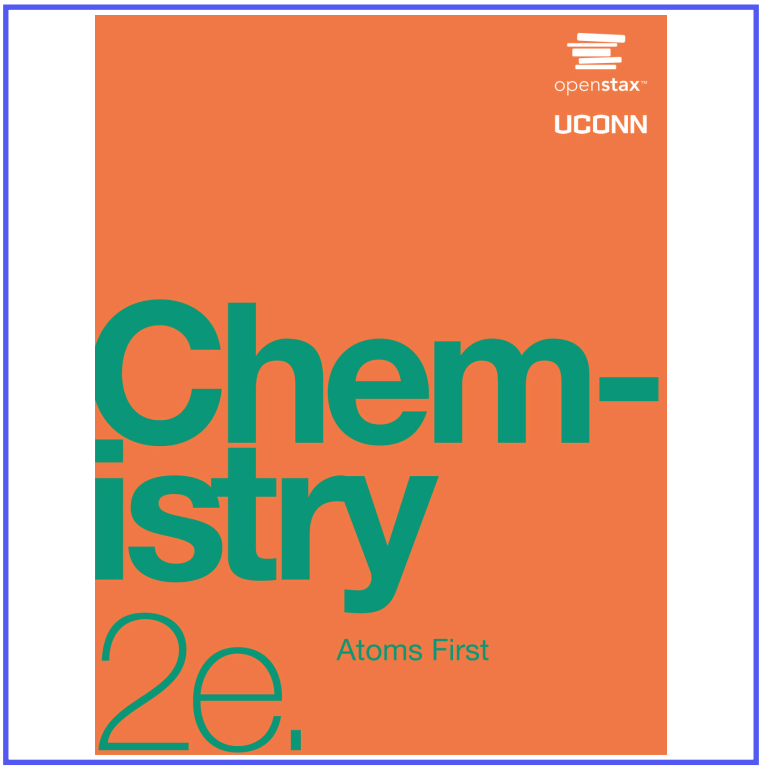



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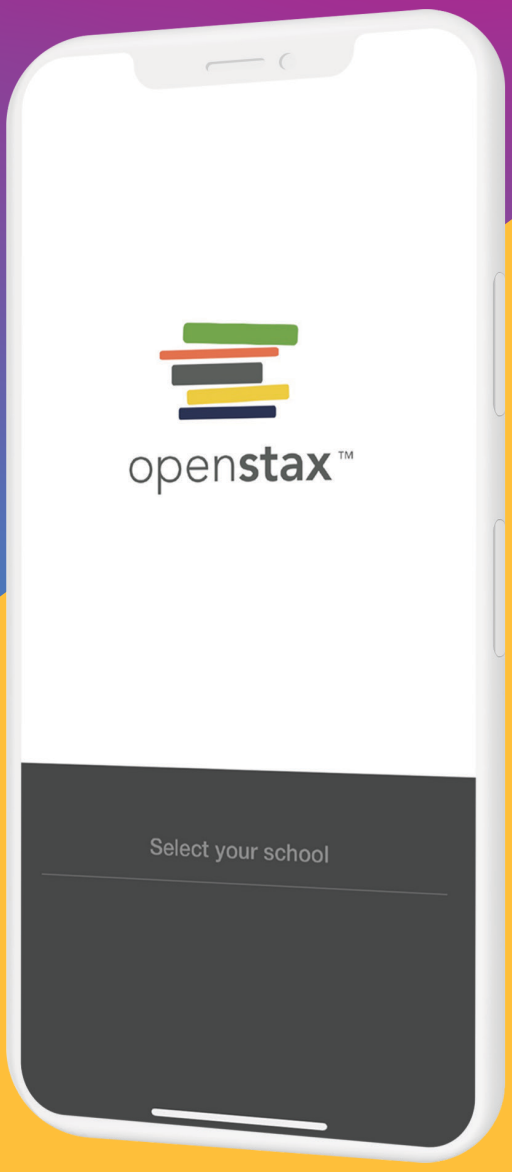
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# Preface

Welcome to *Chemistry: Atoms First 2e*, an OpenStax resource. This textbook was written to increase student access to high-quality learning materials, maintaining the highest standards of academic rigor at little or no cost.

## About OpenStax

OpenStax is a nonprofit based at Rice University, and it's our mission to improve student access to education. Our first openly licensed college textbook was published in 2012, and our library has since scaled to over 30 books for college and AP® courses used by hundreds of thousands of students. OpenStax Tutor, our low-cost personalized learning tool, is being used in college courses throughout the country. Through our partnerships with philanthropic foundations and our alliance with other educational resource organizations, OpenStax is breaking down the most common barriers to learning and empowering students and instructors to succeed.

## About OpenStax resources

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### Format

You can access this textbook for free in web view or PDF through openstax.org, and for a low cost in print.

## About *Chemistry: Atoms First 2e*

This text is an atoms-first adaptation of OpenStax *Chemistry 2e*. The intention of "atoms-first" involves a few basic principles: first, it introduces atomic and molecular structure much earlier than the traditional approach, and it threads these themes through subsequent chapters. This approach may be chosen as a way to delay the introduction of material such as stoichiometry that students traditionally find abstract and difficult, thereby allowing students time to acclimate their study skills to chemistry. Additionally, it gives students a basis for understanding the application of quantitative principles to the chemistry that underlies the entire course. It also aims to center the study of chemistry on the atomic foundation that many will expand upon in a later course covering organic chemistry, easing that transition when the time arrives.

The second edition has been revised to incorporate clearer, more current, and more dynamic explanations, while maintaining the same organization as the first edition. Substantial improvements have been made in the figures,

illustrations, and example exercises that support the text narrative.

## Coverage and scope

In *Chemistry: Atoms First 2e*, we strive to make chemistry, as a discipline, interesting and accessible to students. With this objective in mind, the content of this textbook has been developed and arranged to provide a logical progression from fundamental to more advanced concepts of chemical science. All of the material included in a traditional general chemistry course is here. It has been reorganized in an atoms-first approach and, where necessary, new material has been added to allow for continuity and to improve the flow of topics. The text can be used for a traditional two-semester introduction to chemistry or for a three-semester introduction, an approach becoming more common at many institutions. The goal is to provide a progressive, graduated introduction to chemistry that focuses on the fundamentally atom-focused nature of the subject. Topics are introduced within the context of familiar experiences whenever possible, treated with an appropriate rigor to satisfy the intellect of the learner, and reinforced in subsequent discussions of related content. The organization and pedagogical features were developed and vetted with feedback from chemistry educators dedicated to the project.

## Changes to the second edition

OpenStax only undertakes second editions when significant modifications to the text are necessary. In the case of *Chemistry: Atoms First 2e*, user feedback indicated that we needed to focus on a few key areas, which we have done in the following ways:

**Content revisions for clarity and accuracy.** The revision plan varied by chapter based on need. About five chapters were extensively rewritten and another twelve chapters were substantially revised to improve the readability and clarity of the narrative.

**Example and end-of-chapter exercises.** The example and end-of-chapter exercises in several chapters were subjected to a rigorous accuracy check and revised to correct any errors, and additional exercises were added to several chapters to more fully support chapter content.

**Art and illustrations.** Under the guidance of the authors and expert scientific illustrators, especially those well-versed in creating accessible art, the OpenStax team made changes to much of the art in the first edition of *Chemistry: Atoms First*. The revisions included correcting errors, redesigning illustrations to improve understanding, and recoloring for overall consistency.

**Accessibility improvements.** As with all OpenStax books, the first edition of *Chemistry: Atoms First* was created with a focus on accessibility. We have emphasized and improved that approach in the second edition. To accommodate users of specific assistive technologies, all alternative text was reviewed and revised for comprehensiveness and clarity. Many illustrations were revised to improve the color contrast, which is important for some visually impaired students. Overall, the OpenStax platform has been continually upgraded to improve accessibility.

## Partnership with University of Connecticut and UConn Undergraduate Student Government

*Chemistry: Atoms First 2e* is a peer-reviewed, openly licensed introductory textbook produced through a collaborative publishing partnership between OpenStax and the University of Connecticut and UConn Undergraduate Student Government Association.

## Pedagogical foundation

Throughout *Chemistry: Atoms First 2e*, you will find features that draw the students into scientific inquiry by taking selected topics a step further. Students and educators alike will appreciate discussions in these feature boxes.

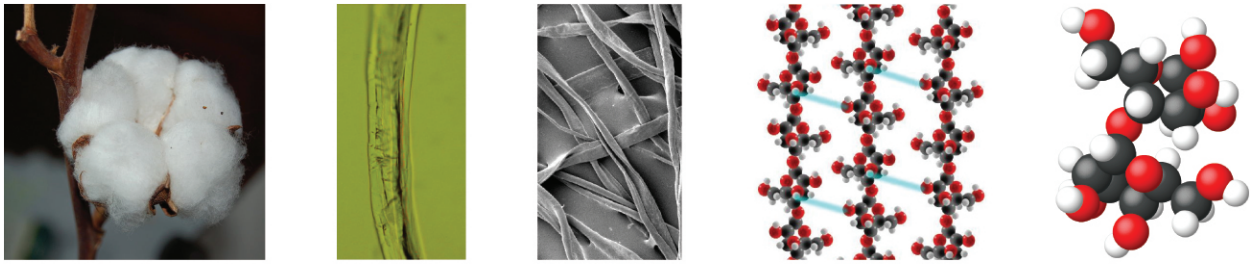
**Chemistry in Everyday Life** ties chemistry concepts to everyday issues and real-world applications of science that students encounter in their lives. Topics include cell phones, solar thermal energy power plants, plastics recycling, and measuring blood pressure.

**How Sciences Interconnect** feature boxes discuss chemistry in context of its interconnectedness with other scientific disciplines. Topics include neurotransmitters, greenhouse gases and climate change, and proteins and enzymes.

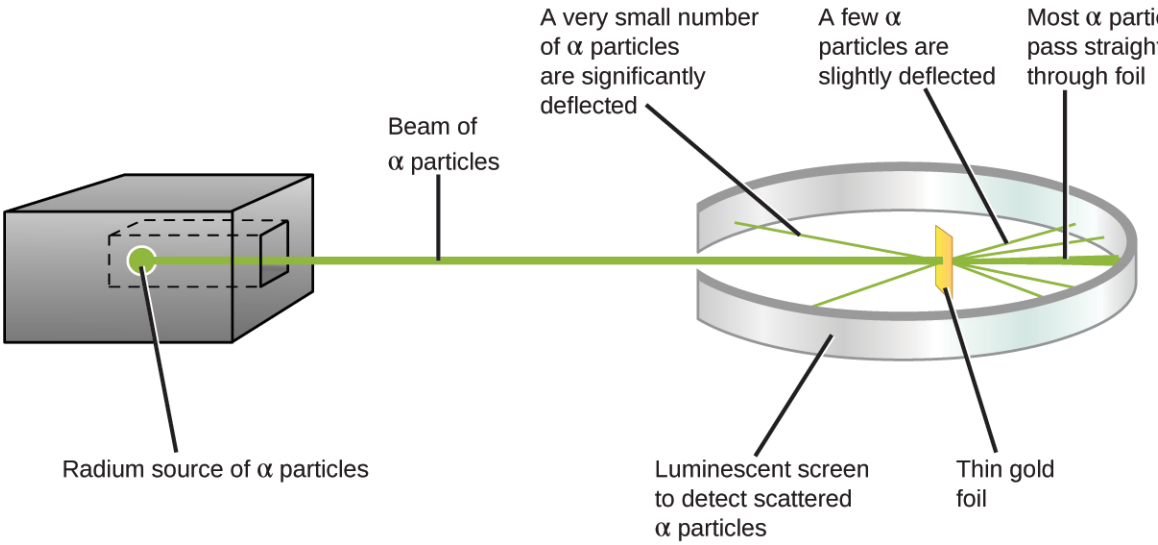
**Portrait of a Chemist** features present a short bio and an introduction to the work of prominent figures from history and present day so that students can see the “faces” of contributors in this field as well as science in action.

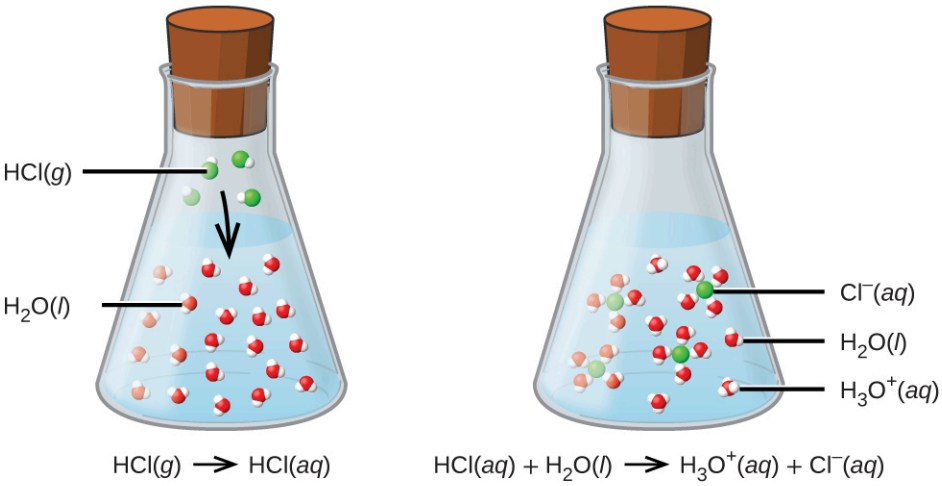
## Comprehensive art program

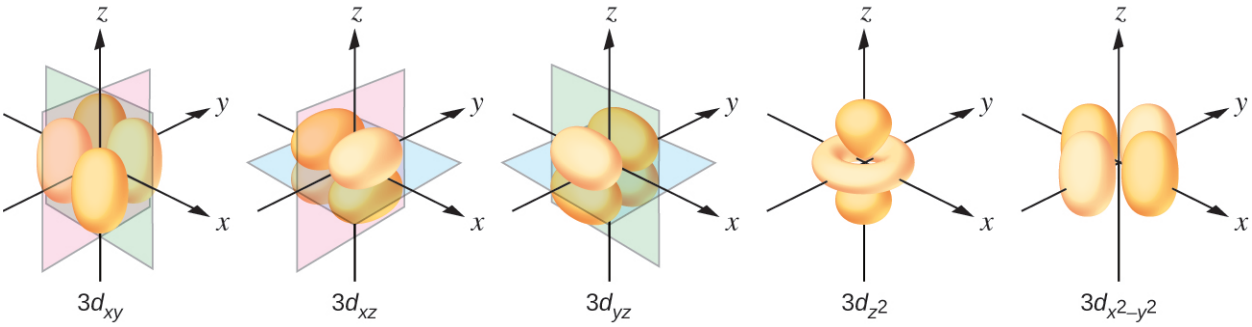
Our art program is designed to enhance students’ understanding of concepts through clear, effective illustrations, diagrams, and photographs.

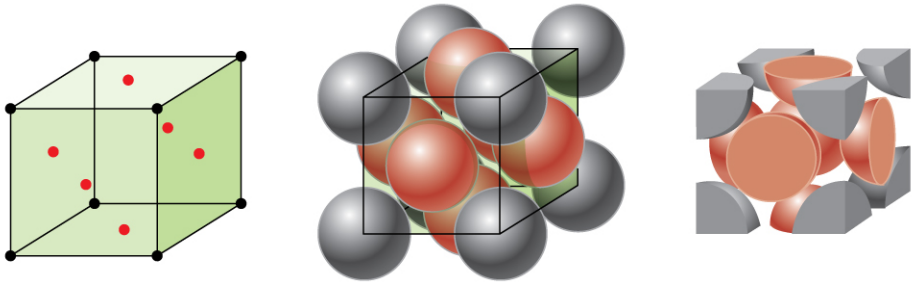


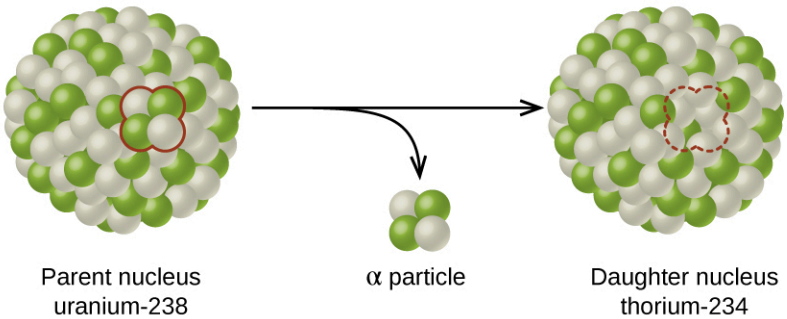
(a) (b) (c) (d) (e)






## Interactives that engage

*Chemistry: Atoms First 2e* incorporates links to relevant interactive exercises and animations that help bring topics to life through our **Link to Learning** feature. Examples include:

PhET simulations