



## Scope & Sequence

### *Exploring Creation with Advanced Chemistry, 2nd Edition*

**GRADE LEVEL:** 12th with prerequisite of Chemistry and Algebra 2

**TEXT SUMMARY:** *Exploring Creation with Advanced Chemistry, 2nd Edition* will take you on a journey through the fascinating world of dancing molecules, balancing electrons, and the physical creation of all things including ourselves. Building on the concepts and tools learned in general chemistry, this text will provide a solid understanding of complex chemistry theories and models so that the student is prepared for the college advanced placement exam.

Module & Major Themes	Summary	Main Themes	Supporting Experiments
<p><b>MODULE 1</b> <i>Units, Chemical Equations, and Stoichiometry Revisited</i></p>	<p>Module 1 reviews basic concepts of chemistry. The modules following will build upon these concepts.</p>	<ul style="list-style-type: none"> <li>• Units Review</li> <li>• Chemical Equations</li> <li>• Hess's Law</li> <li>• Stoichiometry and Limiting Reactants</li> <li>• Stoichiometry, Percent Yield, and Multiple Reactions</li> </ul>	<ul style="list-style-type: none"> <li>• The Strength of Household Ammonia</li> </ul>
<p><b>MODULE 2</b> <i>The Atom Revisited</i></p>	<p>Module 2 delves into the make-up of the world at the atomic level. Grasp the concept of "the atom" in all of its complexity and color.</p>	<ul style="list-style-type: none"> <li>• The Atom</li> <li>• The Bohr Model and Atomic Spectra</li> <li>• The Size of an Atom</li> <li>• Quantum Mechanical Model</li> <li>• Determining Quantum Numbers for Individual Electrons</li> </ul>	<ul style="list-style-type: none"> <li>• Colors in Chemistry</li> </ul>
<p><b>MODULE 3</b> <i>The Electronic Structure of Molecules</i></p>	<p>Module 3 provides an understanding of how atoms interact with each other and share space. Learn the concept and see it in color.</p>	<ul style="list-style-type: none"> <li>• How Atoms Share Electrons</li> <li>• Hybrid Orbitals</li> <li>• Molecular Orbitals</li> <li>• Molecular Orbitals—The Rule Breakers</li> </ul>	<ul style="list-style-type: none"> <li>• The Effect of Solvent on the Color of a Substance</li> </ul>

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<p style="text-align: center;"><b>MODULE 4</b> <i>Intermolecular Forces and the Phases of Matter</i></p>	<p style="text-align: center;">Module 4 provides information about the forces that hold everything together.</p>	<ul style="list-style-type: none"> <li>• Applying the Kinetic Theory of Matter to Phase Changes</li> <li>• Different Types of van der Waals Forces</li> <li>• Cohesive Forces, Adhesive Forces, and Surface Tension</li> <li>• Phase Diagrams</li> <li>• Crystals and Unit Cells</li> <li>• Metallic Crystals</li> <li>• Determining Density from Crystal Structure</li> <li>• Ionic Crystals</li> </ul>	<ul style="list-style-type: none"> <li>• The Kinetic Theory of Matter</li> <li>• Separating a Mixture Using Sublimation</li> <li>• Identifying Unit Cells</li> </ul>
<p style="text-align: center;"><b>MODULE 5</b> <i>Solutions and Colloids</i></p>	<p style="text-align: center;">Module 5 provides the key terms, concepts and mathematical formulas to create and measure solutions. Learn how to use temperature to conceptualize and measure change.</p>	<ul style="list-style-type: none"> <li>• Concentration, Solubility, and the Formation of Solutions</li> <li>• Relating Units of Concentration</li> <li>• Solubility, van der Waals Forces, and Entropy</li> <li>• Temperature and Solubility</li> <li>• The Effect of a Solute on a Solvent's Phase Diagram</li> <li>• Separating Solute From Solvent in a Solution</li> <li>• Colloids</li> </ul>	<ul style="list-style-type: none"> <li>• A Solubility Curve</li> <li>• A Simple Distillation</li> <li>• Paper Chromatography</li> <li>• Forming Colloidal Particles with Soap</li> </ul>
<p style="text-align: center;"><b>MODULE 6</b> <i>Solutions and Equilibrium</i></p>	<p style="text-align: center;">Module 6 clarifies the meaning of equilibrium and why it is important in understanding solubility and saturation. This module also explains <i>the common ion effect</i>.</p>	<ul style="list-style-type: none"> <li>• The Equilibrium Constant and Gibbs Free Energy</li> <li>• Solubility Equilibria</li> <li>• The Common Ion Effect</li> <li>• Precipitation from Solution</li> </ul>	<ul style="list-style-type: none"> <li>• The Common Ion Effect</li> <li>• Precipitation</li> <li>• Making Your Own Precipitate</li> </ul>

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<b>MODULE 7</b> <i>Acid/Base Equilibria</i>	<p>Module 7 applies the equilibrium constant to other types of chemical reactions. This module focuses on acids and bases.</p>	<ul style="list-style-type: none"> <li>• Common Definitions of Acids and Bases</li> <li>• Conjugate Acids and Conjugate Bases</li> <li>• The Real Meaning Behind the pH Scale</li> <li>• Calculating the pH of a Solution of an Acid or Base</li> <li>• Amphiprotic Substances and Their Behaviors</li> <li>• Diprotic and Triprotic Acids</li> <li>• Alternate Definitions of Acids and Bases</li> </ul>	<ul style="list-style-type: none"> <li>• Calculating Concentration from pH</li> </ul>
<b>MODULE 8</b> <i>More on Equilibrium</i>	<p>Module 8 continues to discuss equilibrium while introducing buffers.</p>	<ul style="list-style-type: none"> <li>• Buffer Solutions</li> <li>• The pH of a Buffer</li> <li>• The Common Ion Effect and pH</li> <li>• The Technique of Successive Approximations</li> <li>• Other Equilibrium Situations</li> </ul>	<ul style="list-style-type: none"> <li>• The Bicarbonate Buffer</li> </ul>
<b>MODULE 9</b> <i>Electrochemistry Part 1</i>	<p>Module 9 introduces the concept of electrochemistry by reviewing redox reactions and establishing mathematical equations to produce and measure chemical reactions. Electrolysis is also discussed.</p>	<ul style="list-style-type: none"> <li>• Review of Oxidation Numbers</li> <li>• Analyzing Redox Reactions</li> <li>• Galvanic Cells</li> <li>• The Nernst Equation</li> <li>• Electrolytic Cells</li> <li>• Faraday's Law of Electrolysis</li> </ul>	<ul style="list-style-type: none"> <li>• A Redox Reaction between Copper and Zinc</li> <li>• Making Your Own Galvanic Cell</li> <li>• The Electrolysis of Copper Sulfate</li> </ul>

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<p style="text-align: center;"><b>MODULE 10</b> <i>Electrochemistry</i> Part 2</p>	<p>Module 10 explores electrochemistry that occurs outside of a cell, teaches how to balance redox reactions, and explains how to measure redox reactions.</p>	<ul style="list-style-type: none"> <li>• Balancing Redox Reaction—The Half-Reaction Method</li> <li>• Balancing Redox Reactions—The Change in Oxidation Number Method</li> <li>• The Strengths of Oxidizing and Reducing Agents</li> <li>• Relating Redox Potential to <math>\Delta G</math> and the Equilibrium Constant</li> <li>• Corrosion</li> </ul>	<ul style="list-style-type: none"> <li>• Predicting Redox Reactions</li> </ul>
<p style="text-align: center;"><b>MODULE 11</b> <i>Chemical Kinetics</i></p>	<p>Module 11 focuses on understanding and measuring the kinetic properties of a chemical reaction.</p>	<ul style="list-style-type: none"> <li>• Reaction Rate, the Rate Equation, and the Rate Constant</li> <li>• The Kinetics of a Chemical Reaction</li> <li>• First-Order Chemical Reactions</li> <li>• Second-Order Reactions</li> <li>• The Collision Theory of Chemical Kinetics</li> <li>• Reaction Mechanisms and Reaction Rates</li> </ul>	<ul style="list-style-type: none"> <li>• The Rate of an Iodine Clock Reaction</li> </ul>
<p style="text-align: center;"><b>MODULE 12</b> <i>An Introduction to Organic Chemistry</i></p>	<p>Module 12 introduces organic chemistry, describes what makes something “organic” and compares how it is chemically different from something “inorganic”.</p>	<ul style="list-style-type: none"> <li>• Saturated Hydrocarbons</li> <li>• Alkenes and Alkynes</li> <li>• Aromatic Compounds</li> <li>• Petroleum Polymers</li> </ul>	<ul style="list-style-type: none"> <li>• Investigating the Properties of Polyethylene</li> <li>• Making Slime</li> <li>• Cross-Linking a Polymer</li> </ul>

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<p><b>MODULE 13</b> <i>Functional Groups in Organic Chemistry</i></p>	<p>Module 13 introduces variations of the common organic carbon chain. These are called functional groups.</p>	<ul style="list-style-type: none"> <li>• Alcohols</li> <li>• Ethers</li> <li>• Aldehydes and Ketones</li> <li>• Carboxylic Acids</li> <li>• Esters</li> <li>• Amino Acids and Proteins</li> <li>• Carbohydrates</li> <li>• Organic Chemistry and Biochemistry</li> </ul>	<ul style="list-style-type: none"> <li>• Yeast and Fermentation Process</li> <li>• The Hydrolysis of Sucrose</li> </ul>
<p><b>MODULE 14</b> <i>Nuclear Chemistry</i></p>	<p>Module 10 explores electrochemistry that occurs outside of a cell, teaches how to balance redox reactions, and explains how to measure redox reactions.</p>	<ul style="list-style-type: none"> <li>• Balancing Redox Reaction—The Half-Reaction Method</li> <li>• Balancing Redox Reactions—The Change in Oxidation Number Method</li> <li>• The Strengths of Oxidizing and Reducing Agents</li> <li>• Relating Redox Potential to <math>\Delta G</math> and the Equilibrium Constant</li> <li>• Corrosion</li> </ul>	<p>This module contains no experiments.</p>
<p><b>MODULE 15</b> <i>Review Part 1</i></p>	<p>Module 15 is designed to review basics taught in this course through questions and problems.</p>	<ul style="list-style-type: none"> <li>• Questions and Problems to Assist in Review of the Material Learned in this Course</li> </ul>	<p>This module contains no experiments.</p>
<p><b>MODULE 16</b> <i>Review Part 2</i></p>	<p>Module 16 continues to review the basic and more complex concepts through questions and problems. This module also provides some insight into preparing for the Advanced Placement Chemistry Exam.</p>	<ul style="list-style-type: none"> <li>• Questions and Problems to Assist in the Review of the Material Learned in this Course</li> <li>• How to Prepare for the Advanced Placement Chemistry Exam</li> </ul>	<p>This module contains no experiments.</p>

**ADDITIONAL INFORMATION:** This text has several complementary products that can be found at [apologia.com](http://apologia.com). Additional resources and websites for further exploration of the topics in the text are provided at the Book Extras link for this title.