

## Chemistry

Chemistry is intended to provide a more in-depth study of matter and its interactions. In preceding years students should have developed an understanding for the macroscopic properties of substances and been introduced to the microstructure of substances. This chemistry course will expand upon that knowledge, further develop the microstructure of substances and teach the symbolic and mathematical world of formulas, equations, and symbols.

The major concepts covered are measurement in chemistry, atomic structure, chemical formulas and bonding, chemical reactions, stoichiometry, gases, chemical equilibrium, and organic chemistry. Students at this level should show development in their ability and understanding of scientific inquiry. The units contain experiments and projects that seek to develop a deeper conceptual meaning for the student and actively engage the student. The continued exposure of science concepts and scientific inquiry will serve to improve the student's skill and understanding.

Chemistry should be preceded by an Algebra I course and preceded or accompanied by an Algebra II course.

Upon completion of the course, students should be able to do the following:

- Calculate and convert units using scientific notation and significant figures.
- Explain the differences between elements, compounds, and mixtures.
- Use Avogadro's number and the gas laws to calculate different variables in chemistry examples.
- Explain and use the periodic table.
- Recognize symbols for common elements.
- Differentiate between the different types of bonds.
- Predict how different elements will react.
- Describe acid-base reactions and redox reactions.
- Demonstrate an understanding of organic chemistry and carbon compounds.

Unit 1: Measurement and Analysis	
Assignments	
Chemistry	1. Course Overview
	2. Scientific Method
	3. Lab Safety
	4. An Introduction to Chemistry and Metric Measurement
	5. Report: Metric System*
	6. Quiz 1: Metric Conversions
	7. Showing Precision in Measurements
	8. Using Significant Figures to Show the Reliability of Data
	9. Using Scientific Notation with Significant Figures
	10. Quiz 2: Precision, Significant Figures, and Scientific Notation
	11. Measuring Volume in the Chemistry Laboratory
	12. Project: Practice in Measuring Metric Volumes
	13. Measuring Mass in the Chemistry Laboratory
	14. Project: Measuring Length with Precision
15. Experiment: Masses*	
16. Quiz 3: Measurement and Precision	
17. Observation and Hypothesizing	
18. Learning to Make Useful and Detailed Observations*	
19. Using Graphs to Analyze Data	
20. Project: Tutorial for Making a Scatter Plot Using an Electronic Spreadsheet Program*	
21. Quiz 4: Measurement to Graphs	
22. Doing Chemistry Your Way: Find Your Future	
23. Quiz 5: Chapter Review	
24. Special Project*	
25. Test	
26. Alternate Test*	
27. Glossary and Credits	

Unit 2: Scientific Method	
Assignments	
Chemistry	1. The Basic Ingredient: Chemical Elements
	2. Project: Researching Branches of Chemistry
	3. Quiz 1: Elements- Chemical and Physical Properties
	4. Using Chemical and Physical Properties to Identify Substances
	5. Phase Changes
	6. Experiment: Observation of a Phase Change
	7. Experiment: Salt and Sand*
	8. Inorganic Nomenclature
	9. Creating Compounds: Investigating Chemical Changes
	10. Quiz 2: Elements - Compounds and Chemical Changes
	11. Report: Density*
	12. Identifying Different Types of Mixtures
	13. Experiment: Using the Tyndall Effect to Identify Colloids
	14. Quiz 3: Chapter Review
	15. Special Project*
	16. Test
	17. Alternate Test*
	18. Glossary and Credits

Unit 3: Exploring Laws for Gases and Conservation of Mass	
Assignments	
Chemistry	1. Nothing Stays Put: The Basis for Diffusion and Pressure
	2. Gases and Kinetic Molecular Theory
	3. Project: Graphing Kinetic Energy*
	4. Quiz 1: Diffusion and Kinetic Molecular Theory
	5. The Relationship Between Pressure and Volume in Gases (Boyle's Law)
	6. Quiz 2: Diffusion to P-V Relationships in Gases
	7. The Relationship Between Temperature and Volume in Gases (Charles's Law)
	8. Experiment: Finding Absolute Zero Experimentally
	9. Project: Charles's Law*
	10. Project: Absolute Zero - Real or Theoretical?*
	11. Quiz 3: Diffusion to V-T Relationships in Gases
	12. Combined Gas Law
	13. Quiz 4: Diffusion to Combined Gas Law
	14. Counting Gas Particles: The Measure of the Mole
	15. How Big Is a Mole? Avogadro's Number
	16. Ideal Gas Law
	17. Demonstrating Conservation of Mass with Balanced Equations
	18. Essay: Biography*
	19. Examining the Use of Certain Gases as Propellants*
	20. Quiz 5: Chapter Review
	21. Special Project *
	22. Test
	23. Alternate Test*
	24. Glossary and Credits

Unit 4: The Discovery of Atoms: Nature's Building Blocks	
Assignments	
Chemistry	1. The Golden Years of Chemistry
	2. Experiment: Physical Properties of Elements*
	3. Experiment: Chemical Properties of Some Metals*
	4. Masters of Classic Atomic Theory
	5. Quiz 1: Golden Years to Masters
	6. Designing an Organizational Map: The Periodic Table
	7. Quiz 2: Golden Years to Periodic Table
	8. Electron Configuration
	9. Light Spectra and Excited States
	10. Quiz 3: Golden Years to Bohr Model
	11. Charging Up: Ionization of Atoms
	12. Quiz 4: Golden Years to Ionization
	13. A Closer Look Inside: Nuclear Reactions
	14. Report: Fission Reactors*
	15. Quiz 5: Chapter Review
	16. Special Project*
	17. Project: Types of Energy
	18. Test
	19. Alternate Test*
	20. Glossary and Credits

Unit 5: Molecular Structure	
Chemistry	<b>Assignments</b>
	1. Chemical Accounting: Stoichiometry
	2. Valence Structure
	3. Quiz 1: Stoichiometry to Valences
	4. Determining Chemical Formulas
	5. Balancing Equations
	6. Electron Availability: Prelude to Bonding
	7. Quiz 2: Stoichiometry to Prelude to Bonding
	8. Types of Chemical Bonds
	9. Polar Covalent Molecules and Dot Structures
	10. Intermolecular Bonding
	11. Project: Bonding of Water
	12. Bonding Energy
	13. Experiment: Demonstrating Polar Properties
	14. Quiz 3: Chapter Review
	15. Special Project*
	16. Test
	17. Alternate Test*
18. Glossary and Credits	

Unit 6: Semester Review and Exam	
Chemistry	<b>Assignments</b>
	1. Review
	2. Exam
	3. Alternate Exam- Form A*
	4. Alternate Exam- Form B*

Unit 7: Chemical Reactions, Rates, and Equilibrium	
Chemistry	<b>Assignments</b>
	1. Evidence for Chemical Change
	2. Experiment: Observing Chemical Changes
	3. Reaction Types (1) Combination and Decomposition
	4. Reaction Types (2) Single and Double Displacement
	5. Reaction Types (3) Combustion and Neutralization
	6. Experiment: Chemical Reactions*
	7. Experiment: Ammonium Nitrate*
	8. Quiz 1: Chemical Reactions
	9. Enthalpy of Reaction
	10. Heat Transfer
	11. Calorimetry
	12. Using Gibbs Free Energy to Predict Spontaneous Reactions
	13. Quiz 2: Chemical Change to Entropy and Gibbs Free Energy
	14. Factors that Affect Reaction Rates: Solution Concentration
	15. Experiment: Effect of Solution Concentration on Reaction Rate
	16. Factors that Affect Reaction Rate: Temperature, Catalysts, Concentration of Reactants
	17. Quiz 3: Chemical Change to Reaction Rate
	18. Reaction Equilibria and Equilibrium Constants
	19. Activity: Exploring Factors that Affect Equilibrium
	20. Conditions Affecting Equilibrium
	21. Project: Research a Chemist
	22. Quiz 4: Chapter Review
	23. Special Project*
	24. Test
	25. Alternate Test*
26. Glossary and Credits	

Unit 8: Equilibrium Systems	
Chemistry	<b>Assignments</b>
	1. Chemist's Toolbox
	2. Solutions
	3. Solution Concentration: Molarity
	4. Electrical Nature of Solutions
	5. Solubility
	6. Quiz 1: Toolbox to Solubility
	7. The Dissolving Process
	8. Experiment: Solubility Trends
	9. The Solubility Constant
	10. Quiz 2: Toolbox to Solubility Constant
	11. Acid-Base Equilibria
	12. Experiment: Acid Strength*
	13. pH Scale
	14. Titration of Acids and Bases
	15. Quiz 3: Toolbox to Titration
	16. Redox Equilibria
	17. Redox and Oxidation Potentials
	18. Activity: Solution Concentration vs. Conductivity
	19. pH Calculations
	20. Quiz 4: Chapter Review
	21. Special Project*
	22. Test
	23. Alternate Test*
24. Glossary and Credits	

Unit 9: Carbon Chemistry: Hydrocarbons	
Chemistry	<b>Assignments</b>
	1. Organic Compounds
	2. Sources of Organic Compounds
	3. Experiment: Volatility*
	4. Quiz 1: Carbon Compounds
	5. A Closer Look at the Carbon Atom
	6. Bonding in Organic Compounds
	7. Quiz 2: Organic Compounds to Bonding
8. Organic Nomenclature	
9. Alkanes: Saturated Hydrocarbons	
10. Unsaturated Hydrocarbons	
11. Quiz 3: Hydrogen and Carbon	
12. Special Project*	
13. Test	
14. Alternate Test*	
15. Glossary and Credits	

Unit 10: Carbon Chemistry: Functional Groups	
Chemistry	<b>Assignments</b>
	1. Common Reactions of Saturated Hydrocarbons
	2. Reactions of Unsaturated Hydrocarbons
	3. Quiz 1: Reactions of Saturated and Unsaturated Hydrocarbons
	4. Alcohols
	5. Aldehydes, Acids, and Ketones
	6. Esters
	7. Project: Carbon Allotropes
	8. Quiz 2: Reactions of Saturated and Unsaturated Hydrocarbons to Esters
	9. Nitrogen Functional Groups
	10. Proteins and Amino Acids
	11. Application of Organic Chemistry
	12. Experiment: Preparation of a Polymer
	13. Quiz 3: Chapter Review
	14. Special Project*
	15. Test
	16. Alternate Test*
17. Glossary and Credits	

Unit 11: Chemistry Review	
Chemistry	<b>Assignments</b>
	1. Measurement and Analysis
	2. Scientific Analysis and Significant Figures
	3. Elements, Compounds, and Mixtures
	4. Gases and Moles
	5. Quiz 1: Measurement to Gases and Moles
	6. Atomic Structure and Nuclear Reactions
	7. The Periodic Law
	8. Molecular Structure
	9. Chemical Reactions, Rates, and Equilibrium
	10. Reaction Dynamics
	11. Quiz 2: Measurement to Reaction Dynamics
	12. Solutions
	13. Solubility Equilibrium
	14. Neutralization
	15. Organic Compounds
	16. Hydrocarbon Chemistry
	17. Quiz 3: Chapter Review
	18. Special Project*
	19. Test
	20. Alternate Test*
21. Glossary and Credits	

Unit 12: Semester Review and Exam	
Chemistry	<b>Assignments</b>
	1. Review
	2. Exam
	3. Alternate Exam- Form A*
4. Alternate Exam- Form B*	

Unit 13: Final Exam	
y	<b>Assignments</b>
	1. Exam
	2. Alternate Exam- Form A*
3. Alternate Exam- Form B*	