

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

Unit 2: Scientific Method		
Assignments		
Chemistry	1. The Basic Ingredient: Chemical Elements	10. Quiz 2: Elements - Compounds and Chemical Changes
	2. Project: Researching Branches of Chemistry	11. Report: Density*
	3. Quiz 1: Elements- Chemical and Physical Properties	12. Identifying Different Types of Mixtures
	4. Using Chemical and Physical Properties to Identify Substances	13. Experiment: Using the Tyndall Effect to Identify Colloids
	5. Phase Changes	14. Quiz 3: Chapter Review
	6. Experiment: Observation of a Phase Change	15. Special Project*
	7. Experiment: Salt and Sand*	16. Test
	8. Inorganic Nomenclature	17. Alternate Test*
	9. Creating Compounds: Investigating Chemical Changes	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	12. Combined Gas Law
	2. Gases and Kinetic Molecular Theory	13. Quiz 4: Diffusion to Combined Gas Law
	3. Project: Graphing Kinetic Energy*	14. Counting Gas Particles: The Measure of the Mole
	4. Quiz 1: Diffusion and Kinetic Molecular Theory	15. How Big Is a Mole? Avogadro's Number
	5. The Relationship Between Pressure and Volume in Gases (Boyle's Law)	16. Ideal Gas Law
	6. Quiz 2: Diffusion to P-V Relationships in Gases	17. Demonstrating Conservation of Mass with Balanced Equations
	7. The Relationship Between Temperature and Volume in Gases (Charles's Law)	18. Essay: Biography*
	8. Experiment: Finding Absolute Zero Experimentally	19. Examining the Use of Certain Gases as Propellants*
	9. Project: Charles's Law*	20. Quiz 5: Chapter Review
	10. Project: Absolute Zero - Real or Theoretical?*	21. Special Project *
	11. Quiz 3: Diffusion to V-T Relationships in Gases	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	11. Charging Up: Ionization of Atoms
	2. Experiment: Physical Properties of Elements*	12. Quiz 4: Golden Years to Ionization
	3. Experiment: Chemical Properties of Some Metals*	13. A Closer Look Inside: Nuclear Reactions
	4. Masters of Classic Atomic Theory	14. Report: Fission Reactors*
	5. Quiz 1: Golden Years to Masters	15. Quiz 5: Chapter Review
	6. Designing an Organizational Map: The Periodic Table	16. Special Project*
	7. Quiz 2: Golden Years to Periodic Table	17. Project: Types of Energy
	8. Electron Configuration	18. Test
	9. Light Spectra and Excited States	19. Alternate Test*
	10. Quiz 3: Golden Years to Bohr Model	20. Glossary and Credits

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

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

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

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

Unit 9: Carbon Chemistry: Hydrocarbons	
Chemistry	Assignments
	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	Assignments
	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	Assignments
	1. Measurement and Analysis
	2. Scientific Analysis and Significant Figures
	3. Elements, Compounds, and Mixtures
	4. Gases and Moles
	5. Quiz 1: Measurement to Gasses 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	Assignments
	1. Review
	2. Exam
	3. Alternate Exam- Form A*
4. Alternate Exam- Form B*	

Unit 13: Final Exam	
Chemistry	Assignments
	1. Exam
	2. Alternate Exam- Form A*
3. Alternate Exam- Form B*	