

CURRICULUM OVERVIEW

Chemistry



Table of Contents

CHEMISTRY COURSE OVERVIEW	1
UNIT 1: MEASUREMENT AND ANALYSIS	2
UNIT 2: SCIENTIFIC METHOD	2
UNIT 3: EXPLORING LAWS FOR GASES AND CONSERVATION OF MASS	2
UNIT 4: THE DISCOVERY OF ATOMS: NATURE'S BUILDING BLOCKS	3
UNIT 5: MOLECULAR STRUCTURE	3
UNIT 6: SEMESTER REVIEW AND EXAM	3
UNIT 7: CHEMICAL REACTIONS, RATES, AND EQUILIBRIUM	3
UNIT 8: EQUILIBRIUM SYSTEMS	4
UNIT 9: CARBON CHEMISTRY: HYDROCARBONS	4
UNIT 10: CARBON CHEMISTRY: FUNCTIONAL GROUPS	4
UNIT 11: CHEMISTRY REVIEW	5
UNIT 12: SEMESTER REVIEW AND EXAM	5
Unit 13: Final Exam	5

Chemistry Course Overview

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.

- Measurement and Analysis: Students will explore different types of laboratory measurements.
- **Starting the Investigation:** How to Identify Elements, Compounds, and Mixtures: Students will explore the chemical and physical properties of elements, compounds, and mixtures.
- Exploring Laws for Gases and Conservation of Mass: Students will explore the kinetic molecular theory, the gas laws and the conservation of mass.
- The Discovery of Atoms: Nature's Building Blocks: Students will describe the history and current atomic theory.
- Molecular Structure: Students will explore stoichiometry, chemical bonding, and polar properties.
- Chemical Reactions, Rates and Equilibrium: Students will observe chemical changes, reaction rates, and factors that affect equilibrium.
- Equilibrium Systems: Students will explore solutions and equilibrium systems.
- Carbon Chemistry: Hydrocarbons: Students will describe organic compounds and saturated and unsaturated hydrocarbons.
- Carbon Chemistry: Functional Groups: Students will explore and describe the functional groups in hydrocarbons.

Unit 1: Measurement and Analysis

Assignments

- 1. Course Overview
- 2. Scientific Method
- 3. Lab Safety

Chemistry

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Chemistry

- 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

- Project: Measuring Length with Precision
 Experiment: Masses*
- Experiment: Masses*
 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

- The Basic Ingredient: Chemical Elements
 Project: Researching Branches of Chemistry
 Quiz 1: Elements- Chemical and Physical Properties
 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

- 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
- 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								
	Assig	Assignments							
	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					
try	3.	Experiment: Chemical Properties of Some Metals*	13.	A Closer Look Inside: Nuclear Reactions					
Chemis [.]	4.	Masters of Classic Atomic Theory	14.	Report: Fission Reactors*					
	5.	Quiz 1: Golden Years to Masters	15.	Quiz 5: Chapter Review					
Ŭ	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					
	1.	Chemical Accounting: Stoichiometry	10.	Intermolecular Bonding		
٨	2.	Valence Structure	11.	Project: Bonding of Water		
istr	3.	Quiz 1: Stoichiometry to Valences	12.	Bonding Energy		
emi	4.	Determining Chemical Formulas	13.	Experiment: Demonstrating Polar Properties		
СҺ	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		

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

	Unit 7: (Chemical R	eactions,	Rates,	and Eq	uilibrium
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Assignments

Chemistry

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

	Unit 8: Equilibrium Systems							
	Assig	ignments						
ľ	1.	Chemist's Toolbox	13.	pH Scale				
	2.	Solutions	14.	Titration of Acids and Bases				
nistry	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				
Che	6.	Quiz 1: Toolbox to Solubility	18.	Activity: Solution Concentration vs. Conductivity				
0	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					
	Assig	nments				
	1.	Organic Compounds				
try	2.	Sources of Organic Compounds				
mis	3.	Experiment: Volatility*				
Che	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
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- 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

	Assignments						
	1.	Common Reactions of Saturated Hydrocarbons	9.	Nitrogen Functional Groups			
	2.	Reactions of Unsaturated Hydrocarbons	10.	Proteins and Amino Acids			
try	3.	Quiz 1: Reactions of Saturated and Unsaturated	11.	Application of Organic Chemistry			
mis		Hydrocarbons	12.	Experiment: Preparation of a Polymer			
Che	4.	Alcohols	13.	Quiz 3: Chapter Review			
0	5.	Aldehydes, Acids, and Ketones	14.	Special Project*			
	6.	Esters	15.	Test			
	7.	Project: Carbon Allotropes	16.	Alternate Test*			
	8.	Quiz 2: Reactions of Saturated and Unsaturated	17.	Glossary and Credits			
		Hydrocarbons to Esters					
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	Unit	11: Chemistry Review				
	Assignments					
	1.	Measurement and Analysis	12.	Solutions		
	2.	Scientific Analysis and Significant Figures	13.	Solubility Equilibrium		
>	3.	Elements, Compounds, and Mixtures	14.	Neutralization		
istr	4.	Gases and Moles	15.	Organic Compounds		
em	5.	Quiz 1: Measurement to Gasses and Moles	16.	Hydrocarbon Chemistry		
ch	6.	Atomic Structure and Nuclear Reactions	17.	Quiz 3: Chapter Review		
	7.	The Periodic Law	18.	Special Project*		
	8.	Molecular Structure	19.	Test		
	9.	Chemical Reactions, Rates, and Equilibrium	20.	Alternate Test*		
	10.	Reaction Dynamics	21.	Glossary and Credits		
	11.	Quiz 2: Measurement to Reaction Dynamics				
~	Unit 12: Semester Review and Exam					
nistı	Assig	nments				
Chei	1.	Review	3.	Alternate Exam- Form A*		
0	2.	Exam	4.	Alternate Exam- Form B*		
≥	Unit	13: Final Exam				
misti	Assig	nments				
Cher	1.	Exam	3.	Alternate Exam- Form B*		

(*) Indicates alternative assignment

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Alternate Exam- Form A*