



Switched-On

SCHOOLHOUSE® 2012 EDITION

Curriculum Catalog

Chemistry

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Course Overview

Chemistry is intended to expose students to the designs and patterns in the world that God has created. 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, 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
Assignment Titles

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

UNIT 2: STARTING THE INVESTIGATION: HOW TO IDENTIFY ELEMENTS, COMPOUNDS, AND MIXTURES
Assignment Titles

1. The Basic Ingredient: Chemical Elements	8. Report: Density
2. Quiz 1: Elements, Chemical and Physical Properties	9. Identifying Different Types of Mixtures
3. Using Chemical and Physical Properties to Identify Substances	10. Experiment: Using the Tyndall Effect to Identify Colloids
4. Experiment: Observations of a Phase Change	11. Quiz 3: Chapter Review
5. Experiment: Salt and Sand	12. Special Project
6. Creating Compounds: Investigating Chemical Changes	13. Test
7. Quiz 2: Elements to Compounds and Chemical Changes	14. Alternate Test
	15. Reference

UNIT 3: EXPLORING LAWS FOR GASES AND CONSERVATION OF MASS
Assignment Titles

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

UNIT 4: THE DISCOVERY OF ATOMS: NATURE'S BUILDING BLOCKS
Assignment Titles

1. The Golden Years of Chemistry	10. Charging Up: Ionization of Atoms
2. Experiment: Physical Properties of Elements	11. Quiz 4: Golden Years to Ionization
3. Experiment: Chemical Properties of Some Metals	12. A Closer Look Inside: Nuclear Reactions
4. Masters of Classic Atomic Theory	13. Report: Fission Reactors
5. Quiz 1: Golden Years to Masters	14. Quiz 5: Chapter Review
6. Designing an Organizational Map: The Periodic Table	15. Special Project
7. Quiz 2: Golden Years to Periodic Table	16. Test
8. The Bohr Model Revisited	17. Alternate Test
9. Quiz 3: Golden Years to Bohr Model	18. Reference

UNIT 5: MOLECULAR STRUCTURE
Assignment Titles

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|---|--|
| 1. Chemical Accounting: Stoichiometry | 8. Polar Covalent Molecules and Dot Structures |
| 2. Valence Structure | 9. Experiment: Demonstrating Polar Properties |
| 3. Quiz 1: Stoichiometry to Valence | 10. Quiz 3: Chapter Review |
| 4. Determining Chemical Formulas | 11. Special Project |
| 5. Electron Availability: Prelude to Bonding | 12. Test |
| 6. Quiz 2: Stoichiometry to Prelude to BondingG | 13. Alternate Test |
| 7. Types of Chemical Bonds | 14. Reference |

UNIT 6: SEMESTER REVIEW AND TEST
Assignment Titles

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|-----------|--------------------------|
| 1. Review | 3. Alternate Exam—Form A |
| 2. Exam | 4. Alternate Exam—Form B |

UNIT 7: CHEMICAL REACTIONS, RATES AND EQUILIBRIUM
Assignment Titles

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|--|---|
| 1. Evidence for Chemical Change | 10. Factors that Affect Reaction Rate: Temperature, Catalysts, Concentration of Reactants |
| 2. Experiment: Observing Chemical Changes | 11. Quiz 2: Chemical Change to Reaction Rate |
| 3. Experiment: Chemical Reactions | 12. Reaction Equilibriums and Equilibrium Constants |
| 4. Experiment: Ammonium Nitrate | 13. Activity: Exploring Factors that Affect Equilibrium |
| 5. Enthalpy of Reaction | 14. Conditions Affecting Equilibrium |
| 6. Using Gibbs Free Energy to Predict Spontaneous Reactions | 15. Quiz 3: Chapter Review |
| 7. Quiz 1: Chemical Change to Enotropy and Gibbs Free Energy | 16. Special Project |
| 8. Factors that Affect Reaction Rates: Solution Concentration | 17. Test |
| 9. Experiment: Affect of Solution Concentration on Reaction Rate | 18. Alternate Test |
| | 19. Reference |

UNIT 8: EQUILIBRIUM SYSTEMS
Assignment Titles

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|--|---|
| 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. Reference |

UNIT 9: CARBON CHEMISTRY: HYDROCARBONS
Assignment Titles

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|--|------------------------------------|
| 1. Organic Compounds | 8. Alkanes: Saturated Hydrocarbons |
| 2. Sources of Organic Compounds | 9. Unsaturated Hydrocarbons |
| 3. Experiment: Volatility | 10. Quiz 3: Chapter Review |
| 4. Quiz 1: Organic Compounds and Their Sources | 11. Special Project |
| 5. A Closer Look at the Carbon Atom | 12. Test |
| 6. Bonding in Organic Compounds | 13. Alternate Test |
| 7. Quiz 2: Organic Compounds to Bonding | 14. Reference |

UNIT 10: CARBON CHEMISTRY: FUNCTIONAL GROUPS
Assignment Titles

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|--|--|
| 1. Common Reactions of Saturated Hydrocarbons | 8. Nitrogen Functional Groups |
| 2. Reactions of Unsaturated Hydrocarbons | 9. Proteins and Amino Acids |
| 3. Quiz 1: Reactions of Saturated and Unsaturated Hydrocarbons | 10. Experiment: Preparation of a Polymer |
| 4. Alcohols | 11. Quiz 3: Chapter Review |
| 5. Aldehydes, Acids, and Ketones | 12. Special Project |
| 6. Esters | 13. Test |
| 7. Quiz 2: Reactions of Saturated and Unsaturated Hydrocarbons to Esters | 14. Alternate Test |
| | 15. Reference |

UNIT 11: CHEMISTRY REVIEW
Assignment Titles

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|--|----------------------------|
| 1. Measurement and Analysis | 12. Solutions |
| 2. Scientific Analysis and Significant Figures | 13. Solubility Equilibrium |
| 3. Elements, Compounds, and Mixtures | 14. Neutralization |
| 4. Gases and Moles | 15. Organic Compounds |
| 5. Quiz 1: Measurement to Gases and Moles | 16. Hydrocarbon Chemistry |
| 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. Reference |
| 11. Quiz 2: Measurement to Reaction Dynamics | |

UNIT 12: SEMESTER REVIEW AND TEST
Assignment Titles

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|-----------|--------------------------|
| 1. Review | 3. Alternate Exam—Form A |
| 2. Exam | 4. Alternate Exam—Form B |

UNIT 13: FINAL EXAM
Assignment Titles

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|--------------------------|--------------------------|
| 1. Exam | 3. Alternate Exam—Form B |
| 2. Alternate Exam—Form A | |