

Course Description:

Chemistry B Honors focuses on the energy involved in chemistry and the uses for several types of chemical reactions. Students begin by refreshing and deepening their understanding of the basics of matter and their relation to energy. Next, students explore the properties of solutions, including acids, bases, and their reactions. Then, students dive into thermodynamics, electrochemistry, organic chemistry, and finally nuclear chemistry. In this course, students develop a solid understanding of several universal scientific principles and learn to manipulate the applications of chemistry in real-world settings.

Course Objectives:

- Apply scientific processes to conduct investigations.
- Use logical thinking to identify relationships and draw conclusions.
- Examine how investigations in chemistry are important to gaining historical perspective and understanding the societal value of scientific advances.
- Evaluate topics in chemistry to better understand the nature of chemical bonds, intermolecular forces, solutions, concentration, redox reactions, electrochemistry, organic chemicals, and nuclear reactions.

Required Materials:

Unit 2

Lessons 6–8: Solubility Change with Temperature

- 2 lb of sugar
- large bowl
- hot water
- measuring cup
- glass
- thermometer
- tablespoon

Unit 3

Lessons 11–13: Reaction Rate

- water
- vitamin C tablets
- tincture of iodine
- hydrogen peroxide
- laundry starch
- thermometer
- ice
- stopwatch
- measuring cup
- disposable spoons
- cups
- disposable gloves
- safety glasses

Unit 4

Lessons 17–20: Penny Battery

- ten pennies*

*made after 1982

- cardboard
- scissors
- sheet of sandpaper**

**100 grit

- a small plastic container
- water
- white vinegar
- salt
- one T-1 3/4 (5 mL) red LED
- electrical tape***

***optional

- a towel or napkins

Course Overview:

Unit 1: Properties of Matter

- Matter and Energy
- Bonding and Polarity
- Intermolecular Forces
- Gases and Liquids
- Solids
- Phases
- Phase Changes
- Phase Diagrams and Specific Heat
- Kinetic Molecular Theory and Gases
- Gas Laws
- Combined Gas Law
- Ideal Gas Law

Unit 2: Solutions, Acids, and Bases

- Solvation
- Solubility
- Concentration and Molarity
- Colligative Properties of Solutions
- Special Properties of Water
- Acid-Base Theories
- Acid-Base Dissociation and Neutralization Reactions
- pH and pOH
- Titration

Unit 3: Thermodynamics and Reaction Kinetics

- Thermodynamic Systems and Enthalpy
- Enthalpy Calculations
- Free Energy and Reaction Spontaneity
- Reaction Kinetics

- Reaction Rate
- Reaction Rate Calculations
- Defining Equilibrium
- Equilibrium Expression
- Equilibrium Shifts
- Solubility Equilibrium
- Acid-Base Dissociation
- Buffer Solutions

Unit 4: Redox Reactions and Electrochemistry

- Defining Oxidation and Reduction
- Oxidation Numbers
- Half-Reactions
- Balancing and Predicting Oxidation Reactions
- Electrochemical Cells
- Voltaic Cells
- Standard Cell Potential
- Electrolytic Cells

Unit 5: Organic Chemistry

- Carbon Compounds
- Alkanes
- Alkenes
- Alkynes
- Cyclic Hydrocarbons
- Alcohols and Alkyl Halides
- Ethers, Aldehydes, and Ketones
- Carboxylic Acids and Esters
- Types of Organic Reactions
- Polymers and Polymerization

Unit 6: Nuclear Energy and Review

- Radioactive Decay and Nuclear Stability
- Half-Life
- Nuclear Fission
- Nuclear Fusion