Course Description: Chemistry B builds on the concepts and skills learned in the first semester as students continue to explore the properties of matter and the changes it undergoes. Chemistry B covers topics in chemical reactions and stoichiometry, gases, thermochemistry, kinetics, equilibrium, acids and bases, organic chemistry, and biochemistry. An algebra background is recommended because of the amount and type of math involved.

Module	Lesson Title	Objectives
Module 7: Chemical Reactions	7.1: Balancing Chemical Equations	• Interpret chemical equations in terms of reactants, products, and conservation of mass. • Represent chemical reactions with chemical equations. • Apply the law of conservation of mass to write balanced chemical equations.
	7.2: Types of Chemical Reactions	• Identify the characteristics of different classes of chemical reactions. • Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion. • Use the activity series to determine whether a single replacement reaction will take place.
	7.3: Reactions in Aqueous Solutions	• Describe aqueous solutions. • Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.
	7.4: Solubility	• Define solubility and differentiate between saturated and unsaturated solutions. • Identify the factors affecting solubility. • Use solubility rules to explain if a reaction will take place between two aqueous solutions, and to predict the products of a precipitate reaction.
	7.5: Oxidation-Reduction Reactions	• Describe the processes of oxidation and reduction. • Identify oxidizing and reducing agents. • Determine the oxidation number of an element in a compound. • Interpret redox reactions in terms of change in oxidation state.
	7.6: Electron Transfer in Redox Reactions	• Identify how electrons are shifted during redox reactions. • Describe how oxidation-reduction reactions produce electric current. • Identify the parts of an electrochemical cell and explain how each part operates.

Module	Lesson Title	Objectives
	Project: Green Chemistry	• Predict the properties of elements based on the periodic table. • Explain the outcome of a chemical reaction using evidence from valence electrons and periodic trends. • Design and evaluate solutions to an environmental problem.
Module 8: Chemical Stoichiometry	8.1: Chemical Quantities and the Mole	• Define the mole and describe how it is used in chemistry. • Use Avogadro's number to convert moles to number of particles and number of particles to moles. • Use the mole concept to determine the molar mass of elements and compounds. • Calculate the number of moles in a given mass of a substance and the mass of a given number of moles of a substance.
	8.2: Empirical and Molecular Formulas	• Calculate the percent composition of a compound. • Determine the empirical and molecular formula of a compound.
	8.3: Concentrations of Solutions	• List and describe different ways to express the concentration of a solution. • Use molarity to perform calculations involving solution concentration. • Calculate the dilutions of solutions using molarity. • Explain the nature of colligative properties and give four examples.
	8.4: Stoichiometric Calculations	• Determine the mole ratios from a balanced chemical equation. • Explain the sequence of steps used in solving stoichiometric problems. • Apply the mole concept and the law of conservation of mass to calculate moles, mass, and number or particles involved in a chemical reaction.
	8.5: Limiting Reactant and Percent Yield	• Identify the limiting reactant in a chemical reaction. • Calculate the mass of product when the amounts of more than one reactant are given. • Calculate the theoretical yield and percent yield of a chemical reaction from data.

Module	Lesson Title	Objectives
Module 9: Gases	9.1: Properties of Gases	• Use the kinetic molecular theory to explain the behavior of gases. • Explain how gas pressure is measured. • Explain Dalton's law of partial pressures and use it to calculate the partial pressure of a gas.
	9.2: The Gas Laws	• Use Boyle's law, Charles' law, and Gay- Lussac's law to describe the relationships among the volume, pressure, and temperature of a gas. • Use the combined gas law to calculate the volume, pressure, and temperature of a gas.
	9.3: The Ideal Gas Law	• Relate numbers of particles and volumes by using Avogadro's law. • Relate the amount of gas present to its pressure, temperature, and volume using the ideal gas law. • Compare the properties of real and ideal gases.
	9.4: Gas Stoichiometry	• Identify STP conditions. • Calculate mass and volume of gaseous reactants and products in a chemical reaction using molar mass and molar volume at STP.
Module 10: Thermochemistry, Kinetics and Equilibrium	10.1: Energy and Chemical Change	• Explain what energy is and differentiate between potential and kinetic energy. • Relate chemical potential energy to the heat lost or gained in chemical reactions. • Explain the meaning of enthalpy and enthalpy change in chemical reactions and processes. • Distinguish between endothermic and exothermic chemical processes.
	10.2: Calorimetry and Heat Capacity	• Describe the law of conservation of energy and the processes of heat transfer in terms of calorimetry. • Describe how a calorimeter is used to measure energy absorbed or released. • Perform calculations involving heat, mass, temperature change, and specific heat.
	10.3: Reaction Rates	• Describe the characteristics of chemical equilibrium. • Describe the equilibrium constant and its usefulness. • Explain how Le Chatelier’s principle applies to equilibrium systems.

Module	Lesson Title	Objectives
		• Describe how various factors affect chemical equilibrium.
	10.4: Chemical Equilibrium	• Use graphs as models to illustrate and explain the difference between endothermic and exothermic reactions. • Explain how temperature, concentration, surface area, and catalysts affect the rate of a chemical reaction.
	Project: MRE Technology	• Use graphs as models to illustrate and explain the difference between endothermic and exothermic reactions. • Explain how temperature, concentration, surface area, and catalysts affect the rate of a chemical reaction. • Analyze and discuss the evolution of MRE technology including how it has been adapted for new purposes..
Module 11: Acids and Bases	11.1: Acids and Bases	• Identify the properties of acids and bases. • Compare the Arrhenius and Brønsted-Lowry models of acids and bases. • Classify solutions as acidic, basic, or neutral. • Relate the strength of an acid or base to its degree of ionization.
	11.2: Calculating pH	• Define pH and pOH. • Calculate the pH and pOH of aqueous solutions.
	11.3: Neutralization Reactions	• Identify a neutralization reaction and describe the reactants and products of neutralization. • Write chemical equations for neutralization reactions.
	11.4: Acid-Base Titration	• Explain how neutralization reactions are used in acid-base titrations. • Identify the characteristics of an equivalence point. • Describe the materials and equipment used in acid-base titration.
	Project: Ocean Chemistry	• Describe how issues and technological innovations impact watersheds and water resources. • Explain how changes in levels of nitrogen and carbon dioxide can affect the pH of the oceans.

Module	Lesson Title	Objectives
		• Explain why ocean acidification affects the shells of marine organisms. • Apply Le Chatelier's principle to refine chemical systems by specifying changes to conditions that affect the products of chemical reactions in equilibrium.
Module 12: Organic and Biological Chemistry	12.1: Simple Hydrocarbons	• Explain why there are millions of different organic compounds. • Describe the structure of alkanes, alkenes, and alkynes. • Identify alkanes, alkenes, and alkynes from their name or structure. • Compare the properties of alkenes and alkynes with those of alkanes.
	12.2: Branched-Chain Hydrocarbons	• Name and draw structures for alkanes, alkenes,and alkynes, including branched-chain hydrocarbons. • Relate the number and arrangement of carbon atoms in hydrocarbons to their properties.
	12.3: Functional Groups	• Describe and give examples of functional groups. • Identify the functional groups that characterize alcohols, aldehydes, ketones, carboxylic acids, and esters. • Classify organic compounds based on their functional groups. • Explain how functional groups contribute to the properties of carbon compounds.
	12.4: Proteins and Carbohydrates	• Describe the structure of amino acids and proteins. • Explain the role of proteins in cells. • Describe the structure of monosaccharides, disaccharides, and polysaccharides. • Explain the function of carbohydrates in living things.
	12.5: Lipids and Nucleic Acids	• Describe the structure of fatty acids, triglycerides, phospholipids, and steroids. • Explain the function of lipids in living things. • Identify the structurel components of nucleic acids. • Relate the function of DNA and RNA to their structure.