Options EHS Chemistry B-OR	Scope and Sequence
Unit Lesson	**Objectives**
Energy in Chemical Reactions	
Energy	
	Differentiate among the various forms of energy, including kinetic energy, potential energy, chemical energy, and thermal energy.
	Explain that energy can be transformed from one form to another.
	Describe the law of conservation of energy.
	Science Practice: Integrate concepts from both chemistry and physics to analyze energy transformations and the conservation of energy.
Heat	
	Relate temperature to the average molecular kinetic energy.
	Describe heat flow in terms of the motion of atoms or molecules.
	Distinguish between exothermic chemical processes and endothermic chemical processes.
	Science Practice: Analyze and interpret information about a reaction to classify the reaction as either an exothermic process or an endothermic process.
Calorimetry	
	Differentiate between heat capacity and specific heat.
	Solve problems involving heat flow and temperature changes to calculate the specific heat of a substance.
	Define calorimetry and explain how calorimeters work.
	Use calorimetry to calculate the heat of a chemical process.
	Science Practice: Perform mathematical calculations involving heat, mass, temperature change, and specific heat.
Lab: Calorimetry and Specific Heat	
	Determine the specific heat of a metal using a calorimeter.
	Systematically collect, organize, record, and analyze data.

Options EHS Chemistry B-OR		Scope and Sequence
Unit	**Lesson**	**Objectives**
		Demonstrate safe laboratory practices while using a calorimeter.
		Identify possible sources of procedural and mathematical errors in an experiment.
		Science Practice: Precisely follow a multistep procedure to build and use a calorimeter.
	Thermochemical Equations	
		Understand the use of enthalpy in thermochemistry.
		Use thermochemical equations to calculate energy changes (i.e., enthalpy changes) that occur in a chemical reaction.
		Use thermochemical equations to calculate energy changes (i.e., enthalpy changes) that occur in a combustion reaction.
		Science Practice: Examine books and other sources of information to find standard enthalpies of formation to solve thermochemical problems.
	Enthalpy of Reaction	
		Demonstrate how to produce an overall chemical equation from equations for intermediate reaction steps.
		Apply Hess's law to calculate enthalpy change in a reaction.
		Science Practice: Translate quantitative information expressed in words in a text into a visual form by drawing enthalpy diagrams.
	Unit Test	
Acid-Base Reactions		
	Properties of Acids and Bases	
		Describe the observable properties of acids.
		Describe the observable properties of bases.
		Describe applications of acids and bases.
		Science Practice: Determine the meaning of the key terms acid and base as they are used in chemistry.
	Arrhenius, Bronsted-Lowry, and Lewis Acids and Bases	

Options EHS Chemistry B-OR		Scope and Sequence
Unit	**Lesson**	**Objectives**
		Describe the Arrhenius definitions of acids and bases.
		Describe the Bronsted-Lowry definitions of acids and bases.
		Identify conjugate acids and conjugate bases in a Bronsted-Lowry acid-base reaction.
		Describe the Lewis definitions of acids and bases.
		Science Practice: Describe how Arrhenius's, Bronsted's, Lowry's, and Lewis's competing interpretations of the same evidence are useful in different ways.
	pH	
		Describe the self-ionization of water.
		Define pH and pOH.
		Convert between pH and hydrogen ion concentration, and between pOH and hydroxide ion concentration.
		Convert between pH and pOH, and between hydrogen ion concentration and hydroxide ion concentration.
		Use the pH scale to characterize the acidity and basicity of solutions.
		Science Practice: Solve scientific problems involving pH using logarithmic functions.
	Lab: Measuring pH	
		Measure the pH of various substances using a universal indicator and its key.
		Science Practice: Calibrate the scale for a pH indicator by comparing it to data measured using a known scale.
	Neutralization Reactions	
		Predict the products of acid-base neutralization reactions.
		Define salt and describe the observable properties of salts and salt solutions.
		Write equations and net ionic equations for neutralization reactions.
		Science Practice: Use domain-specific symbols to correctly write net ionic equations.
	Unit Test	
Redox and Organic Chemistry		

Options EHS Chemistry B-OR		Scope and Sequence
Unit	**Lesson**	**Objectives**
	Oxidation-Reduction	
		Follow rules to assign oxidation numbers to atoms in compounds.
		Define oxidation and reduction, and identify oxidized and reduced species.
		Identify oxidation-reduction (redox) reactions.
		Science Practice: Establish context by describing oxidation-reduction reactions in living and nonliving systems.
	Balancing Oxidation-Reduction Equations	
		Write half-reactions for oxidation-reduction reactions.
		Use the half-reaction method to balance oxidation-reduction equations.
		Science Practice: Develop the half-reaction procedure to solve scientific problems as an alternate method of balancing equations.
	Fuel Cells	
		Describe fuel cells.
		Explain the benefits of fuel-cell cars.
		Describe drawbacks and limitations of fuel-cell cars.
		Science Practice: Investigate a science-based societal issue (i.e., the possible use of fuel-cell cars) by researching the literature and analyzing the data. Then, construct a defense for one side of the issue.
	Organic Compounds	
		Describe carbon’s unique bonding characteristics that make the diversity of carbon compounds possible.
		Read and draw structural formulas of organic compounds.
		Explain the difference between structural isomers and geometric isomers.
		Science Practice: Use different models to represent the same idea (ball-and-stick models, space-filling models, and structural formulas) and explain the usefulness and limitations of each kind of model.
	Properties and Uses of Saturated Hydrocarbons	

Options EHS Chemistry B-OR		Scope and Sequence
Unit	**Lesson**	**Objectives**
		Describe the properties of straight-chain alkanes, branched-chain alkanes, and cycloalkanes.
		Use the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds.
		Identify uses of saturated hydrocarbons.
		Science Practice: Build vocabulary knowledge by learning how to name hydrocarbons.
	Properties and Uses of Unsaturated Hydrocarbons	
		Describe the properties of alkenes, alkynes, and aromatic hydrocarbons.
		Use the system for naming the ten simplest linear hydrocarbons and isomers that contain double bonds, triple bonds, and benzene rings.
		Identify uses of unsaturated hydrocarbons including uses in pharmaceuticals, petrochemicals, plastics, and food.
		Science Practice: Describe different alkenes and alkynes that can be found in nature.
	Functional Groups	
		Identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids.
		Describe uses and natural occurrences of compounds containing functional groups.
		Science Practice: Translate technical information expressed in words in a text about functional groups into a visual form, such as a chart.
	Organic Reactions	
		Identify substitution, addition, condensation, and elimination reactions.
		Explain that large molecules (polymers) are formed by repetitive combinations of simple subunits.
		Compare addition polymerization and condensation polymerization.
		Science Practice: Construct explanations on how polymers form.
	Unit Test	
Nuclear Chemistry		

Options EHS Chemistry B-OR		Scope and Sequence
Unit	**Lesson**	**Objectives**
	The Nucleus	
		Explain how protons and neutrons in the nucleus are held together by nuclear forces.
		Differentiate chemical and nuclear reactions in terms of energy released.
		Explain why Einstein's equation E = mc2 is used to determine the nuclear binding energy.
		Identify some naturally occurring isotopes of elements that are radioactive.
		Science Practice: Analyze a sequence (i.e., radioactive decay) that is characteristic of natural phenomena.
	Types of Radioactive Decay	
		Differentiate between chemical reactions and nuclear reactions.
		Identify types of radioactive decay.
		Science Practice: Translate technical information expressed in words in a text about nuclear radiation into a visual form, such as a table, to compare the different types of radiation.
	Balancing Nuclear Reactions	
		Write symbols for nuclides using mass numbers and atomic numbers.
		Balance nuclear equations by balancing both mass and atomic numbers.
		Science Practice: Determine the meaning of nuclide symbols and use those symbols to balance nuclear equations.
	Half-Life	
		Describe what a half-life is.
		Calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed.
		Calculate the number of half-lives that have passed given mass data for the radioactive substance.
		Science Practice: Solve scientific problems by substituting quantitative values.
	Lab: Half-Life	
		Understand the concept of half-life through simulation.
		Explain how the half-life of a radioactive element is determined.

Options EHS Chemistry B-OR		Scope and Sequence
Unit	**Lesson**	**Objectives**
		Collect, organize, and record appropriate data while doing an investigation on half-life.
		Communicate valid conclusions for a investigation modeling half-life.
		Science Practice: Develop and use a model for studying half-life.
	Nuclear Fission and Nuclear Fusion	
		Explain and compare fission and fusion reactions.
		Relate the role of nuclear fusion to the production of essentially all elements heavier than helium.
		Science Practice: Justify the need for peer review in science.
	Nuclear Energy	
		Describe how nuclear power plants work.
		Describe the issues surrounding nuclear waste.
		Science Practice: Weigh the merits of using nuclear energy to solve society’s need for electrical energy by comparing a number of human, economic, and environmental costs and benefits.
	Unit Test	
Cumulative Exam		
	Cumulative Exam Review	
	Cumulative Exam	