

Systems	Properties, Patterns, and Models
<b>5 – The student knows that energy transformations occur during physical or chemical changes.</b>	<b>4 – The student knows the characteristics of matter.</b>
<p>5A – Identify changes in matter, determine the nature of the change and examine the forms of energy involved.</p> <p>5B – Identify and measure energy transformations and exchanges involved in chemical reactions.</p> <p>5C – Measure the effects of the gain or loss of heat energy on the properties of solids, liquids, and gases.</p>	<p>4A – Differentiate between physical and chemical properties of matter.</p> <p>4B – Analyze examples of solids, liquids, gases to determine their characteristics.</p> <p>4C – Investigate and identify properties of mixtures and pure substances.</p> <p>4D – Describe the physical and chemical characteristics of an element using the periodic table and make inferences about its chemical behavior.</p>
<b>9 – The student knows the processes, effects, and significance of nuclear fission and nuclear fusion.</b>	<b>6- The student knows that atomic structure is determined by nuclear composition, allowable electron cloud, and subatomic particles.</b>
<p>9A – Compare fission and fusion reactions in terms of the masses of the reactants and products and the amount of energy released in the nuclear reactions.</p> <p>9B – Investigate radioactive elements to determine half-life.</p> <p>9C – Evaluate the commercial use of nuclear energy and medical uses of radioisotopes.</p> <p>9D – Evaluate environmental issues associated with the storage, containment, and disposal of nuclear wastes.</p>	<p>6A – Describe the existence and properties of subatomic particles.</p> <p>6B – Analyze stable and unstable isotopes of an element to determine the relationship between the isotope's stability application.</p> <p>6C - Summarize the historical development of the periodic table to understand the concept of periodicity.</p>
	<b>7 – The student knows the variables that influence the behavior of gases.</b>
	<p>7A – Describe the interrelationships of gases contained within a closed system.</p> <p>7B – Illustrate the data obtained from investigations with gases in a closed system and determine if the data are consistent with the Universal Gas Law.</p>
	<b>8 – The student knows how atoms form bonds to acquire a stable arrangement of electrons.</b>
	<p>8A – Identify characteristics of atoms involved in chemical bonding.</p> <p>8B – Investigate and compare the physical and chemical properties and chemical properties of ionic and covalent compounds.</p> <p>8C – Compare the arrangement of atoms in molecules, ionic crystals, polymers, and metallic substances.</p> <p>8D – Describe the influence of intermolecular forces on the physical and chemical properties of covalent compounds.</p>
	<b>10 – The student knows common oxidation-reduction reactions.</b>
	<p>10A – Identify oxidation-reduction processes.</p> <p>10B – Demonstrate and document the effects of a corrosion process and evaluate the importance of electroplating metals.</p>
	<b>11 – The student knows that balanced chemical equations are used to interpret and describe the interactions of matter.</b>
	<p>11A – Identify common elements and compounds using scientific nomenclature.</p> <p>11B – Demonstrate the use of symbols, formulas, and equations in describing interactions of matter.</p> <p>11C – Explain the balance of chemical and nuclear equations using number of atoms, masses, and charge.</p>

## Properties, Patterns, and Models

### 12 – The student knows the factors that influence the solubility in a solvent.

12A – Demonstrate and explain effects of temperature and the nature of solids solutes on solubility of solids.

12B – Develop general rules for solubility through investigations with aqueous solutions.

12C – Evaluate the significance of water as a solvent in living organisms in the environment.

### 13 – The student knows relationships among the concentration, electrical conductivity, and colligative properties of a solution.

13A – Compare unsaturated, saturated and supersaturated solutions.

13B – Interpret relationships among ionic and covalent compounds, electrical conductivity, and colligative properties of water.

13C – Measure and compare the rates of reaction of a solid reactant in solutions of varying concentration.

### 14 – The student knows the properties and behavior of acids and bases.

14A – Analyze and measure common household products using a variety of indicators to classify the products as acids or bases.

14B – Demonstrate the electrical conductivity of acids and bases.

14C – Identify the characteristics of a neutralization reaction.

14D – Describe the effects of acids and bases on an ecological system.

### 15 – The student knows factors involved in chemical reactions.

15A – Verify the law of conservation of energy by evaluating the energy exchange that occurs as a consequence of a chemical reaction.

15B – Relate the rate of a chemical reaction to temperature, concentration, surface area, and presence of a catalyst/inhibitor.