Science Learning Targets

Physical Science

Unit 1 – Motion and Force

SPS8. Obtain, evaluate, and communicate information to explain the relationships among force, mass, and motion.

a. **Plan and carry out an investigation to analyze the motion of an object using mathematical and graphical models. (Clarification statement: Mathematical and graphical models could include distance, displacement, speed, velocity, time and acceleration.) (Skill)**

- I can distinguish between distance and displacement. (Knowledge)
- I can define and explain the differences between speed, velocity, and acceleration and mathematically solve for each using word problems. (Knowledge)
- I can identify and use appropriate SI units when performing calculations of speed, velocity and acceleration. (Knowledge)
- I can calculate speed/velocity from distance-time graphs. (Knowledge)
- I can calculate acceleration from a velocity-time graph. (Knowledge)
- I can analyze and interpret a distance-time graph to describe the motion of an object. (Reasoning)
- I can analyze and interpret a velocity-time graph to describe the motion of an object. (Reasoning)
- I can determine what tools are needed to gather relevant data for analysis of motion of an object. (Reasoning)
- I can analyze the relationship between the factors that control the rate of change of position. (velocity) (Reasoning)
- I can analyze the relationship between the factors that control the rate of change of velocity. (acceleration) (Reasoning)
- I can plan and carry out an investigation to analyze the motion of an object using mathematical and graphical representations. (Skill)

b. **Construct an explanation based on experimental evidence to support the claims presented in Newton's three laws of motion. (Clarification statement: Evidence could demonstrate relationships among force, mass, velocity, and acceleration.) (Reasoning)**

- I can determine balanced and unbalanced forces and calculate the net force of an object. (Knowledge)
- I can draw the free body diagrams of real situations. (Knowledge)
- I can state Newton's three laws of motion and give examples and/or scenarios in which each apply. (Knowledge)
- I can explain Newton's First Law of motion as it relates to inertia. (Knowledge)
- I can explain the relationship between force, mass, and acceleration in Newton's 2nd Law of motion. (Knowledge)
- I can use F=ma to calculate unknown quantities. (Knowledge)
- I can identify the action and reaction of a pair of forces. (Knowledge)
- I can analyze scenarios to determine which of Newton's laws of motion corresponds with each scenario. (Reasoning)

Unit – Motion and Force (cont.)

- I can use Newton's 3 laws to support claims about everyday situations. (Reasoning)
- I can construct an explanation based on experimental evidence to support the claims presented in Newton's three laws of motion. (Product)

c. Analyze and interpret data to identify the relationship between mass and gravitational force for falling objects. (Reasoning)

- I can explain the difference between gravitational force and mass. (Knowledge)
- I can identify the appropriate SI units for mass and gravity. (Knowledge)
- I can identify gravitational acceleration as a variable independent of an object's mass. (Knowledge)
- I can determine the weight of objects based on their mass and the force of gravity. (Knowledge)
- I can describe the effect of drag on the free fall of an object and how it results in the terminal velocity of an object. (Reasoning)
- I can analyze and interpret data to identify the relationship between mass and the gravitational force for falling objects. (Reasoning)
- I can analyze mass and gravity data to identify how weight would be affected. (Reasoning)

d. Use mathematics and computational thinking to identify the relationships between work, mechanical advantage, and simple machines. (Reasoning)

- I can identify and give examples of simple machines. (Knowledge)
- I can describe scenarios for when a particular type of simple machine may be used. (Knowledge)
- I can define work and mechanical advantage. (Knowledge)
- I can explain how machines make doing work easier. (Knowledge)
- I can calculate the work and mechanical advantage for simple machines. (Reasoning)
- I can analyze a model of a simple machine to calculate the mechanical advantage. (Reasoning)
- I can infer which machines would be better suited for specific tasks based on their mechanical advantage. (Reasoning)
- I can use mathematical thinking to support explanations for the force-distance trade off that occurs when a simple machine is used. (Reasoning)

Unit 2 – Energy

SPS7. Obtain, evaluate, and communicate information to explain transformations and flow of energy within a system.

a. **Construct explanations for energy transformations within a system. (Clarification statement: Types of energy to be addressed include chemical, mechanical, electromagnetic, light, sound, thermal, electrical, and nuclear.) (Reasoning)**

- I can identify and describe the different types of energy forms including chemical, mechanical, electromagnetic, light, sound, thermal, electrical, and nuclear energy. (Knowledge)
- I can identify (track) the types of energy transformation that occur within a system. (Knowledge)
- I can define the Law of Conservation of Energy. (Knowledge)
- I can describe energy transformations between different forms of energy. (Reasoning)
- I can explain the difference between open and closed systems. (Reasoning)
- I can summarize the energy transformation within a system. (Reasoning)
- I can explain how the Law of Conservation of Energy applies to a system by showing energy is only transferred and not lost. (Reasoning)
- I can construct explanations for energy transformations in an open and closed system. (Reasoning)

b. **Plan and carry out investigations to describe how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation. (Skill)**

- I can distinguish between conduction, convection and radiation and give examples of each. (Knowledge)
- I can define temperature, heat, and thermal energy. (Knowledge)
- I can explain what is required for thermal energy transfer to occur. (Knowledge)
- I can explain how energy is transferred from particle to particle in conduction, convection and radiation. (Reasoning)
- I can classify given scenarios as conduction, convection or radiation. (Reasoning)
- I can infer which method of heat transfer occurs within a system. (Reasoning)
- I can plan and carry out an investigation that illustrates the molecular motion of substances in terms of thermal energy. (Skill)
- I can communicate data from an investigation to provide evidence of molecular motion of substances in terms of thermal energy. (Product)

Unit 2 – Energy (cont.)

c. Analyze and interpret specific heat data to justify the selection of a material for a practical application (e.g., insulators and cooking vessels). (Reasoning)

- I can define specific heat and explain how specific heat relates to heat transfer. (Knowledge)
- I can list the differences between conductors and insulators. (Knowledge)
- I can identify factors affecting specific heat. (Knowledge)
- I can explain how the value of specific heat determines its use as a conductor or insulator. (Knowledge)
- I can solve basic problems using the formula for specific heat ($Q=mc\Delta T$). (Knowledge)
- I can identify the units for specific heat (Knowledge).
- I can infer whether a material will function as a conductor or an insulator based on its specific heat. (Reasoning)
- I can compare specific heat data to rank the usefulness of a material as a conductor or insulator based on its specific heat. (Reasoning)
- I can analyze and interpret specific heat data to justify the selection of a conductor or insulator for a practical application. (Reasoning)

d. Analyze and interpret data to explain the flow of energy during phase changes using heating/cooling curves. (Reasoning)

- I can list and define the phase changes. (Knowledge)
- I can draw and label a phase change diagram. (Knowledge)
- I can draw and label a heating or cooling curve. (Knowledge)
- I can explain what a heating/cooling curve shows. (Knowledge)
- I can describe how energy flows on a heating & cooling curve. (Reasoning)
- I can explain the difference between endothermic and exothermic reactions as it relates to the flow of energy during phase changes. (Reasoning)
- I can predict what happens to the flow of energy in a given scenario based on trends on a heating/cooling curve. (Reasoning)
- I can classify phase changes based on the flow of energy. (Reasoning)
- I can compare how temperature affects the release or absorption of energy. (Reasoning)
- I can create a heating/cooling curve for a substance from given experimental data. (Reasoning)
- I can analyze and interpret data provided by phase change diagrams and heating & cooling curves to explain how energy flows during phase changes. (Reasoning)

Unit 3 – Properties of Waves

SPS9. Obtain, evaluate, and communicate information to explain the properties of waves.

a. Analyze and interpret data to identify the relationships among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves. (Reasoning)

- I can define the wavelength, frequency, energy, and amplitude. (Knowledge)
- I can explain the difference between electromagnetic and mechanical waves. (Knowledge)
- I can analyze how changes in wavelength, frequency, energy, and amplitude can affect each other. (Reasoning)
- I can predict whether the energy in an electromagnetic wave will increase or decrease based on changes in frequency. (Reasoning)
- I can analyze diagrams of mechanical waves to determine which has the highest or lowest energy. (Reasoning)
- I can analyze diagrams of electromagnetic waves to determine which has the longest or shortest wavelength and the highest or lowest frequency. (Reasoning)
- I can analyze and interpret data to identify the relationships among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves. (Reasoning)

b. Ask questions to compare and contrast the characteristics of electromagnetic and mechanical waves. (Reasoning)

- I can classify waves as either electromagnetic waves or mechanical waves. (Knowledge)
- I can identify the following parts of a wave from electromagnetic and mechanical waves: amplitude, frequency, rarefactions, wavelengths, compressions, crest, and trough. (Knowledge)
- I can explain the difference between mechanical and electromagnetic waves. (Knowledge)
- I can explain why mechanical waves cannot travel through a vacuum. (Knowledge)
- I can explain why electromagnetic waves can travel through a vacuum. (Knowledge)
- I can compare and contrast the characteristics of electromagnetic waves and mechanical waves. (Reasoning)
- I can classify waves as mechanical or electromagnetic based on data. (Reasoning)
- I can ask questions to compare and contrast the characteristics of electromagnetic and mechanical waves. (Reasoning)

Unit 3 – Properties of Waves (cont.)

c. Develop models based on experimental evidence that illustrate the phenomena of reflection, refraction, interference, and diffraction. (Product)

- I can define refraction, reflection, diffraction, and interference. (Knowledge)
- I can describe the behaviors of reflection, refraction, interference, diffraction, and the Doppler Effect. (Knowledge)
- I can identify which wave behavior applies to given real-world scenarios. (Knowledge)
- I can explain how wave behaviors differ in mechanical waves versus electromagnetic waves. (Knowledge)
- I can use models to classify examples of refraction, reflection, diffraction, and interference as applied to mechanical and electromagnetic waves. (Reasoning)
- I can analyze real-world scenarios to determine which wave behavior is present. (Reasoning)
- I can infer practical uses of wave behaviors. (Reasoning)
- I can develop models that illustrate wave interactions such as reflection, refraction, diffraction and interference in light and sound waves. (Product)

d. Analyze and interpret data to explain how different media affect the speed of sound and light waves. (Reasoning)

- I can list the factors that affect the speed of sound and light waves. (Knowledge)
- I can identify how different types of media affect the speed of light. (Knowledge)
- I can identify how different types of media affect the speed of sound. (Knowledge)
- I can predict what will happen to the speed of sound and light waves in different media. (Reasoning)
- I can compare how specific media have different effects on the speed of a sound wave versus a light wave. (Reasoning)
- I can analyze and interpret data to describe how the speed of sound and light waves. (Reasoning)

e. Develop and use models to explain the changes in sound waves associated with the Doppler Effect. (Product)

- I can define Doppler Effect. (Knowledge)
- I can describe the apparent frequency changes in the Doppler Effect. (Reasoning)
- I can describe how the Doppler Effect occurs in the natural world. (Reasoning)
- I can use Doppler Effect to describe why objects moving toward you sound different than objects moving away from you, (Reasoning)
- I can develop and use a model to explain the apparent frequency changes in the Doppler Effect. (Product)

Unit 4 – Electricity and Magnetism

SPS10. Obtain, evaluate, and communicate information to explain the properties of and relationships between electricity and magnetism.

a. **Use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance. (Reasoning)**

- I can define voltage, current, and resistance. (Knowledge)
- Identify and describe the components in a circuit responsible for voltage, current and resistance. (Knowledge)
- I can describe the relationships between the factors present in Ohm's Law. (Knowledge)
- I can, using the appropriate units, calculate voltage, current, and resistance using Ohm's Law. (Knowledge)
- I can infer how changes in voltage affect current and resistance. (Reasoning)
- I can infer how changes in current affect voltage and resistance. (Reasoning)
- I can infer how changes in resistance affect current and voltage. (Reasoning)
- I can predict how voltage, current, and resistance will change as new loads, pathways, or voltage sources are added to a circuit. (Reasoning)
- I can interpret data tables and graphs for voltage, current, and resistance to support a claim about the relationship between voltage, current, and resistance. (Reasoning)
- I can use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance. (Reasoning)

b. **Develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits. (Clarification statement: Advantages and disadvantages of series and parallel circuits should be addressed.) (Product)**

- I can describe the difference between alternating and direct current. (Knowledge)
- I can describe the difference between conventional current and the flow of electrons. (Knowledge)
- I can explain the flow of electrons in a circuit. (Knowledge)
- I can describe how current is affected by a parallel circuit versus a series circuit. (Knowledge)
- I can list advantages and disadvantages of series and parallel circuits. (Knowledge)
- I can infer which type of circuit would be best used in different scenarios. (Reasoning)

Unit 4 – Electricity and Magnetism (cont.)

- I can analyze examples of series and parallel circuits to explain the flow of electrons in each and the changes both undergo as components of the circuit are added. (Reasoning)
- I can design a functional simple series circuit and a parallel circuit. (Product)
- I can develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits. (Product)

c. Plan and carry out investigations to determine the relationship between magnetism and the movement of electrical charge. (Clarification statement: Investigations could include electromagnets, simple motors, and generators.) (Skill)

- I can describe how an electrical charge flows and how electrical charges attract/repel. (Knowledge)
- I can define and explain magnetism. (Knowledge)
- I can describe how magnetic force affects the flow of electrical current. (Knowledge)
- I can describe how current through a wire around an object affects its magnetism. (Knowledge)
- I can explain the structure and function of electromagnets. (Knowledge)
- I can explain the relationship between magnetism and the movement of electrical charge. (Reasoning)
- I can predict how changes in an electric field affect a magnetic field. (Reasoning)
- I can apply the concept of electromagnetic induction to explain the operation of generators. (Reasoning)
- I can apply the concepts of electromagnetism to electric motors. (Reasoning)
- I can plan and conduct an investigation to determine the relationship between magnetism and the movement of electrical charge. (Skill)
- I can design an electromagnet that demonstrates the relationship between magnetism and electric charge. (Product)
- I can communicate data from an investigation to provide evidence of the relationship between magnetism and the movement of electrical charge. (Product)

Unit 4 – Matter

SPS1. Obtain, evaluate, and communicate information from the Periodic Table to explain the relative properties of elements based on patterns of atomic structure.

a. **Develop and use models to compare and contrast the structure of atoms, ions and isotopes. (Clarification statement: Properties include atomic number, atomic mass and the location and charge of subatomic particles.) (Product)**

- I can define atomic number and atomic mass. (Knowledge)
- I can define atoms, ions, and isotopes. (Knowledge)
- I can identify properties of atoms, ions and isotopes to include atomic number, atomic mass, and the location and charge of subatomic particles. (Knowledge)
- I can identify, describe and give the location of subatomic particles, including protons, electrons, and neutrons. (Knowledge)
- I can explain how ions are formed based on gain or loss of electrons. (Knowledge)
- I can explain why isotopes differ from atoms of the same element. (Knowledge)
- I can infer the charge of an ion based on subatomic particles present. (Reasoning)
- I can predict the type of ion that will form with a given element. (Reasoning)
- I can compare isotopes to atoms to analyze the subatomic particles present in each. (Reasoning)
- I can perform atomic mass calculations for atoms, ions, and isotopes. (Skill)
- I can create a model of an atom using its properties as shown in the Periodic Table. (Product)
- I can draw a Bohr's model and a Lewis dot structure for neutral atoms and ions. (Product)
- I can develop and use models to compare and contrast the structure of atoms, ions and isotopes. (Product)

b. **Analyze and interpret data to determine trends of the following: □Number of valence electrons, □Types of ions formed by main group elements, □Location and properties of metals, nonmetals, and metalloids. (Reasoning)**

- I can identify the elements phase at room temperature based on their location on the periodic table.
- I can define and identify characteristic properties of metals, nonmetals, and metalloids. (Knowledge)
- I can identify reactivity of elements on the Periodic Table based on location. (Knowledge)
- I can explain how ions are formed for representative elements based on number of valence electrons. (Reasoning)
- I can analyze and interpret data to determine trends of the number of valence electrons, types of ions formed by main groups of elements, phases at room temperature and location and properties of metals, nonmetals and metalloids. (Reasoning)

Unit 4 – Matter (cont.)

c. Use the Periodic Table as a model to predict the properties of main group elements.

- I can find the phase, valence electrons, general properties, and the ionic charge of elements in the Periodic Table. (Knowledge)
- I can describe how the Periodic Table is arranged with respect to properties of main group elements. (Reasoning)
- I can use the Periodic Table as a model to predict properties of main group elements. (Skill)

SPS2. Obtain, evaluate, and communicate information to explain how atoms bond to form stable compounds.

a. Analyze and interpret data to predict properties of ionic and covalent compounds. (Clarification statement: Properties are limited to types of bonds formed, elemental composition, melting point, boiling point, and conductivity.) (Reasoning)

- I can define ionic and covalent compounds. (Knowledge)
- I can define melting point, boiling point, and conductivity. (Knowledge)
- I can explain the difference between physical and chemical properties. (Knowledge)
- I can identify common chemical symbols and formulas. (Knowledge)
- I can classify compounds as ionic or covalent based on given properties. (Reasoning)
- I can predict the properties of a compound based on whether it is ionic or covalent. (Reasoning)
- I can predict the properties of binary ionic and binary covalent bonds by analyzing and interpreting data. (Reasoning)
- I can distinguish between ionic and covalent bonds by interpreting chemical symbols and formulas. (Reasoning)
- I can analyze and interpret data to predict properties of ionic and covalent compounds. (Reasoning)

b. Develop and use models to predict formulas for stable, binary ionic compounds based on balance of charges. (Product)

- I can explain what a subscript represents in a chemical formula. (Knowledge)
- I can list oxidation numbers for representative group elements to be used when writing chemical formulas for binary ionic compounds. (Knowledge)
- I can infer whether a compound is ionic based on its chemical nomenclature. (Reasoning)
- I can use models to relate stable, binary ionic compounds to the balance of charges. (Reasoning)
- I can write formulas for stable, binary ionic compounds based on balance of charges. (Reasoning)
- I can write Lewis dot structures to show compound formation based on elements' location on the Periodic Table. (Product)
- I can develop and use models to predict formulas for stable, binary ionic compounds based on balance of charges. (Product)

Unit – Matter (cont.)

c. **Use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for translating between chemical names and chemical formulas. (Clarification statement: Limited to binary covalent and binary ionic, containing main group elements, compounds but excludes polyatomic ions.) (Reasoning)**

- I can recognize that the International Union of Pure and Applied Chemistry (IUPAC) nomenclature is used to name chemicals. (Knowledge)
- I can use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature to identify the names of simple chemicals. (Reasoning)
- I can infer whether a compound is ionic or covalent based on its chemical nomenclature. (Reasoning)
- I can use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for translating between simple binary chemical names and chemical formulas (one to one chemical compounds). (Reasoning)

SPS5. Obtain, evaluate, and communicate information to compare and contrast the phases of matter as they relate to atomic and molecular motion.

a. **Ask questions to compare and contrast models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas. (Reasoning)**

- I can define and list characteristics of the phases of matter: solid, liquid, gases, and plasma. (Knowledge)
- I can explain the molecular arrangement of particles for each phase of matter. (Knowledge)
- I can describe the kinetic energy of each phase of matter. (Knowledge)
- I can compare and contrast models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas. (Reasoning)
- I can infer the phase of matter of a substance based on a given particle arrangement. (Reasoning)
- I can analyze a heating/cooling curve to infer where each phase of matter is present. (Reasoning)
- I can use a model to identify particle arrangement and motion in solids, liquids, gases and plasmas. (Reasoning)
- I can ask questions to compare and contrast models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas. (Reasoning)

Unit – Matter (cont.)

b. Plan and carry out investigations to identify the relationships among temperature, pressure, volume, and density of gases in closed systems. (Clarification statement: Using specific Gas laws to perform calculations is beyond the scope of this standard; emphasis should focus on the conceptual understanding of the behavior of gases rather than calculations.) (Skill)

- I can recognize that relationships exist among temperature, pressure, volume, and density of gases in closed systems. (Knowledge)
- I can identify the gas laws and explain the variable held constant in each. (Knowledge)
- I can predict what will happen to the variables in a gas when one variable is changed. (Reasoning)
- I can investigate how volume, pressure, temperature and density of gas molecules interrelate. (Skill)
- I can plan and carry out investigations to identify the relationships among temperature, pressure, volume, and density of gases in closed systems. (Skill)

Unit 5 – Reactions

SPS3. Obtain, evaluate, and communicate information to support the Law of Conservation of Matter.

a. **Plan and carry out investigations to generate evidence supporting the claim that mass is conserved during a chemical reaction. (Clarification statement: Limited to synthesis, decomposition, single replacement, and double replacement reactions.) (Skill)**

- I can state the law of conservation of mass. (Knowledge)
- I can differentiate and give examples of different types of chemical reactions. (Knowledge)
- I can explain that the number of atoms present in a chemical reaction directly corresponds to the overall mass of the reaction. (Knowledge)
- I can evaluate evidence to determine whether or not mass is conserved during a chemical reaction. (Reasoning)
- I can predict relative amounts of atoms produced from a chemical reaction based on the Law of Conservation of Mass. (Reasoning)
- I can use a model to explain that the total number of atoms is conserved during a chemical reaction. (Skill)
- I can plan and carry out investigations to generate evidence supporting the claim that mass is conserved during a chemical reaction. (Skill)
- I can communicate data from an investigation to provide evidence supporting the claim that mass is conserved during a chemical reaction. (Product)

b. **Develop and use a model of a chemical equation to illustrate how the total number of atoms is conserved during a chemical reaction. (Clarification statement: Limited to chemical equations that include binary ionic and covalent compounds and will not include equations containing polyatomic ions.) (Product)**

- I can explain that the total number of atoms is conserved during a chemical reaction. (Knowledge)
- I can balance chemical equations to show that mass is conserved. (Knowledge)
- I can determine whether or not a chemical equation is balanced and relate this to conservation of mass. (Reasoning)
- I can use a model to explain that the total number of atoms is conserved during a chemical reaction. (Skill)
- I can balance chemical equations to show that mass is conserved. (Skill)
- I can develop and use a model of a chemical equation to illustrate how the total number of atoms is conserved during a chemical reaction. (Product)

Unit 5 – Reactions (cont.)

SPS6. Obtain, evaluate, and communicate information to explain the properties of solutions.

a. Develop and use models to explain the properties (solute/solvent, conductivity, and concentration) of solutions. (Products)

- I can define solution, solute and solvent. (Knowledge)
- I can define concentration in terms of solute per unit solvent (i.e. dilute, concentrated, saturated, unsaturated, super-saturated). (Knowledge)
- I can recognize that when placed in a solution, solutes will affect the conductivity of that solution. (Knowledge)
- I can compare and contrast solutes, solvents and solutions. (Reasoning)
- I can differentiate between a solute and a solvent within a solution. (Reasoning)
- I can determine if a given solution is unsaturated, saturated, or supersaturated. (Reasoning)
- I can explain how a solute can be made to dissolve faster in a solution. (Reasoning)
- I can determine the concentration of a solution when given the mass of the solute and a volume of solvent. (Reasoning)
- I can develop and use models to explain the properties of solutions. (Product)

b. Plan and carry out investigations to determine how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent. (Skill)

- I can recognize the factors that affect the solubility rate of a solute within a solution. (Knowledge)
- I can list variables that affect the solubility of a substance. (Knowledge)
- I can explain how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent. (Reasoning)
- I can explain the effect that changing each variable will have on the solubility of a substance. (Reasoning)
- I can predict the approximate rate of solution given the physical conditions of the solution. (Reasoning)
- I can predict rate of dissolving in a specific solvent based on the conditions of temperature, surface area, and agitation. (Reasoning)
- I can plan and carry out investigations to determine how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent. (Skill)
- I can communicate data from investigations to provide evidence of how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent. (Product)

Unit 5 – Reactions (cont.)

c. Analyze and interpret data from a solubility curve to determine the effect of temperature on solubility. (Reasoning)

- I can recall that heat affects the rate of solubility of a solute. (Knowledge)
- I can explain the purpose of a solubility curve. (Knowledge)
- I can define concentration in terms of saturated, unsaturated, and supersaturated. (Knowledge)
- I can compare solubility of different solutions. (Reasoning)
- I can use a solubility curve to relate temperature and the solubility of a solute in a solution. (Reasoning)
- I can use a solubility curve to make predictions about the amount of a solute within a solution. (Reasoning)
- I can analyze and interpret data from a solubility curve to determine the effect of temperature on solubility. (Reasoning)

d. Obtain and communicate information to explain the relationship between the structure and properties (e.g., pH, and color change in the presence of an indicator) of acids and bases. (Clarification statement: Limited to only the structure of simple acids and bases (e.g., HCl and NaOH) that demonstrates the presence of an H+ or OH-.) (Reasoning)

- I can list properties of acids, bases, and neutral substances. (Knowledge)
- I can explain how pH is related to acids and bases. (Knowledge)
- I can explain how the structure of an acid or base is related to the type of ion present. (Knowledge)
- I can describe the role of an indicator in classifying substances as acids, bases, or neutral. (Knowledge)
- I compare and contrast simple acids and bases. (Reasoning)
- I can compare the pH level of acids and bases. (Reasoning)
- I can classify acids and bases as strong or weak depending on their location on the pH scale. (Reasoning)
- I can obtain and communicate information to explain the relationship between the structure and properties of acids and bases. (Reasoning)

e. Plan and carry out investigations to detect patterns in order to classify common household substances as acidic, basic, or neutral. (Skill)

- I can recognize that household substances can be classified as acidic, basic, or neutral. (Knowledge)
- I can compare physical and chemical properties of acids and bases. (Reasoning)
- I can describe patterns in information provided to classify common household substances as acidic, basic, or neutral. (Reasoning)
- I can plan and carry out investigations to detect patterns in order to classify common household substances as acidic, basic, or neutral. (Skill)

Unit 6 – Nuclear Chemistry

SPS4. Obtain, evaluate, and communicate information to explain the changes in nuclear structure as a result of fission, fusion and radioactive decay.

a. Develop a model that illustrates how the nucleus changes as a result of fission and fusion. (Product)

- I can differentiate between fission and fusion. (Knowledge)
- I can explain how the nucleus changes as a result of fission and fusion. (Knowledge)
- I can classify a reaction as being fission or fusion based on a given chemical equation. (Reasoning)
- I can predict what happens to the nucleus in a given fission or fusion reaction. (Reasoning)
- I can develop a model that illustrates how the nucleus changes as a result of fission and fusion. (Product)

b. Use mathematics and computational thinking to explain the process of half-life as it relates to radioactive decay. (Clarification statement: Limited to calculations that include whole half-lives.) (Reasoning)

- I can define half-life and radioactive decay. (Knowledge)
- I can demonstrate the half-life of a substance using models. (Knowledge)
- I can explain why radioactive decay occurs. (Knowledge)
- I can list practical uses for radioactive decay. (Knowledge)
- I can infer the age of a substance based on its half-life. (Reasoning)
- I can analyze graphical data to determine how much of a substance remains after a given number of half-lives. (Reasoning)
- I can predict how much of a substance remains when given how much time has passed and the length of a half-life (Reasoning)
- I can use mathematics and computational thinking to explain the process of half-life as it relates to radioactive decay. (Reasoning)

Unit 6 – Nuclear Chemistry (cont.)

c. Construct arguments based on evidence about the applications, benefits, and problems of nuclear energy as an alternative energy source. (Product)

- I can identify how scientific information influences public policy and perception regarding alternative energy sources, specifically nuclear energy. (Knowledge)
- I can compare and contrast the impacts of nuclear energy as an alternative energy source. (Reasoning)
- I can gather and synthesize information from multiple credible sources about the applications, benefits, and problems of nuclear energy as an alternative energy source. (Reasoning)
- I can analyze and interpret quantitative and qualitative data regarding nuclear energy as an alternative energy source. (Reasoning)
- I can construct arguments based on evidence about the applications, benefits, and problems of nuclear energy as an alternative energy source. (Product)