2022 - 2023, HS, Physical Science, Quarter 1

Big Ideas/Key Concepts:

- **Science applies mathematics to investigate questions, solve problems, and communicate findings.**
- **Objects move in ways that can be observed, described, predicted, and measured.**
- **Forces cause changes in an object's motion.**
- **Energy is always conserved as it flows through a system.**

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Quarter 2 Quarter 3 Quarter 4
WCS Physical Science OER

Standards	Student Friendly "I Can" Statements
Motion **PSCI.PS2.1** Use mathematical representations to show how various factors (e.g., position, time, direction of force) affect one-dimensional kinematics parameters (distance, displacement, speed, velocity, acceleration). Determine graphically the relationships among those one-dimensional kinematics parameters. **PSCI.PS2.2** Algebraically solve problems involving constant velocity and constant acceleration in one-dimension.	**Motion** I can use equations to relate position, velocity, acceleration, and time. I can distinguish between a vector and a scalar quantity. I can draw and interpret graphs of position, velocity, and acceleration vs time in a given scenario. I can solve problems using $v=\Delta d/t$, $a=\Delta v/t$, and $d= \frac{1}{2}at^2+vt$.

Forces	**Forces**
PSCI.PS2.3 Use free-body diagrams to illustrate the contact and non-contact forces acting on an object.	I can add or subtract vectors graphically to determine the net force. I can model the forces acting on an object using a free-body diagram.
PSCI.PS2.4 Plan and conduct an investigation to gather evidence and provide a mathematical explanation about the relationship between force, mass, and acceleration. Solve related problems using F=ma.	I can plan, conduct, and analyze the results of an experiment that models the relationship between force, mass, and acceleration. I can solve problems using F=ma.
PSCI.PS2.5 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.	I can define momentum by p=mv. I can use evidence to support the law of conservation of momentum.
PSCI.PS2.6 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on an object during a collision.	I can design, test, and improve a device that minimizes the force on an object during a collision.
Energy	**Energy**
PSCI.PS3.1 Identify and give examples of the various forms of energy (kinetic, gravitational potential, elastic potential) and solve mathematical problems regarding the work-energy theorem and power.	I can identify and give examples of kinetic, gravitational potential, and elastic potential energy. I can solve problems using: $E_{kinetic}=\frac{1}{2}mv^2$, $E_{potential}=mgh$, $W_{net}= E_{kf}-E_{ki}$, and $P=W/t$.

PSCI.PS3.3 Design, build, and refine a device within design constraints that has a series of simple machines to transfer energy and/or do mechanical work.	I can design, build, and improve a useful complex machine that transfers energy or does mechanical work.
PSCI.PS3.4 Collect data and present your findings regarding the law of conservation of energy and the efficiency, mechanical advantage, and power of the refined device.	I can collect data and present my findings on the efficiency, mechanical advantage, and power of my device.
PSCI.PS3.5 Investigate the relationships among kinetic, potential, and total energy within a closed system (the law of conservation of energy).	I can relate the changes in kinetic and potential energy to total energy in a closed system. I can use the law of conservation of energy to explain real world and lab experiences.

2022 - 2023, HS, Physical Science, Quarter 2

Big Ideas/Key Concepts:

- **Waves transmit energy without transporting matter.**
- **Wave behavior is medium dependent**
- **Electrical circuits control the flow of electrons to convert electrical energy into other useful types of energy.**
- **Visible light is only one small band of the electromagnetic spectrum.**

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Quarter 1 Quarter 3 Quarter 4
WCS Physical Science OER

Standards	Student Friendly "I Can" Statements
Electricity	**Electricity**
PSCI.PS3.7 Demonstrate Ohm's Law through the design and construction of simple series and parallel circuits.	I can apply Ohm's Law in the design and construction of series and parallel circuits. I can sketch and interpret series and parallel circuit diagrams. I can calculate the total resistance of a circuit.
PSCI.PS2.7 Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field.	I can design and carry out an experiment demonstrating that electric currents produce magnetic fields.
Waves	**Waves**
PSCI.PS4.1 Use scientific reasoning to compare and contrast the properties of	I can classify transverse and longitudinal waves by their properties. I can compare and contrast examples of transverse and longitudinal waves.

transverse and longitudinal waves and give examples of each type.	
PSCI.PS4.3 Develop and use mathematical models to represent the properties of waves including frequency, amplitude, wavelength, and speed.	I can describe a wave in terms of its frequency, amplitude, wavelength, and speed. I can develop a mathematical relationship between wave speed, wavelength, and frequency.
PSCI.PS4.2 Design/conduct an investigation and interpret gathered data to explain how mechanical waves transmit energy through a medium.	I can solve problems using $v=f\lambda$. I can design and conduct an investigation of the energy carried by mechanical waves.
Electromagnetic Waves	**Electromagnetic Waves**
PSCI.PS4.4 Describe and communicate the similarities and differences across the electromagnetic spectrum. Research methods and devices used to measure these characteristics.	I can use experimental evidence to relate energy to amplitude and frequency. I can analyze the speed, wavelength, and frequency of bands across the electromagnetic spectrum.
PSCI.PS4.5 Research and communicate scientific explanations about how electromagnetic waves are used in modern technology to produce, transmit, receive, and store information. Examples include: medical imaging, cell phones, and wireless networks.	I can research methods and devices used to measure features of the electromagnetic spectrum. I can research and explain how electromagnetic waves are used in everyday technology.

2022 - 2023, HS, Physical Science, Quarter 3

Big Ideas/Key Concepts:

- **Atomic and subatomic structures dictate the properties of a substance.**
- **Models of the atom become more sophisticated over time.**
- **Atoms transfer or share electrons to form chemical bonds.**

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Quarter 1 Quarter 2 Quarter 4
WCS Physical Science OER

Standards	Student Friendly "I Can" Statements
Matter and Change	**Matter and Change**
PSCI.PS1.3 Construct a graphical organizer for the major classifications of matter using composition and separation techniques.	I can classify matter as an element, compound, solution, suspension, or colloid. I can choose and perform appropriate methods of separation for a mixture. I can construct a graphic organizer to classify matter.
PSCI.PS1.4 Apply scientific principles and evidence to provide explanations about physical and chemical changes.	I can use evidence to classify a change as either chemical or physical. I can identify when a substance has been transformed into a new substance.
Atoms and Nuclear Chemistry	**Atoms and Nuclear Chemistry**
PSCI.PS1.5 Trace the development of the modern atomic theory to describe atomic particle properties and position.	I can compare historical models of the atom and illustrate changes over time (Democritus to Quantum Model).

	I can cite historical experiments to explain the improvement of the atomic model over time. I can describe subatomic particles in terms of their location, mass, and charge.
PSCI.PS1.6 Characterize the difference between atoms of different isotopes of an element.	I can describe the differences between atoms in terms of their subatomic particles.
PSCI.PS1.14 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.	I can draw a Bohr model for the first 18 elements.
PSCI.PS1.15 Communicate scientific and technical information about nuclear energy and radioactive isotopes with respect to their impact on society.	I can compare and contrast fission and fusion reactions. Using pictures or diagrams, I can model nuclear reactions in terms of particle and energy changes. I can balance nuclear reactions. I can research applications of nuclear energy and radioactive isotopes and their impact on society. I can communicate the benefits and dangers of a real-world application of nuclear science.
Electrons and Bonding	**Electrons and Bonding**
PSCI.PS1.7 Use the periodic table as a model to predict the relative properties of elements.	I can use the periodic table to compare chemical and physical properties of main group elements. (Number of valence electrons, ion charge, reactivity, atomic radius) I can explain a difference in atomic radii using a Bohr diagram.

PSCI.PS1.8 Using the patterns of electrons in the outermost energy level, predict how elements may combine.	I can predict the number of valence electrons in an atom. I can model bonding using the Lewis structures of atoms.
Compounds	**Compounds**
PSCI.PS1.9 Use the periodic table as a model to predict the formulas of binary ionic compounds. Explain and use the naming conventions for binary ionic and molecular compounds.	I can predict the formulas and names of ionic compounds. I can predict the formulas and names of covalent compounds. I can justify the differences between the naming rules for ionic and molecular compounds.
PSCI.PS1.12 Classify a substance as acidic, basic, or neutral by using pH tools and appropriate indicators.	I can use a pH meter or indicators to classify a substance as acidic, basic, or neutral.
PSCI.PS1.13 Research and communicate explanations on how acid rain is created and its impact on the ecosystem.	I can research and communicate explanations on how acid rain is created, including its impact on the ecosystem.

2022 - 2023, HS, Physical Science, Quarter 4

Big Ideas/Key Concepts:

- **Chemical change is the rearrangement of atoms.**
- **Energy is stored in the arrangement and motion of atoms.**

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WCS Physical Science OER

Standards	Student Friendly "I Can" Statements
Chemical Reactions **PSCI.PS1.10** Develop a model to illustrate the claim that atoms and mass are conserved during a chemical reaction (i.e., balancing chemical equations). **PSCI.PS1.11** Use models to identify chemical reactions as synthesis, decomposition, single-replacement, and double-replacement. Given the reactants, use these models to predict the products of those chemical reactions. **Energy & Heat** **PSCI.PS3.9** Demonstrate the impact of the starting amounts of reacting substances upon the energy released.	**Chemical Reactions** I can model the law of conservation of mass using particle diagrams. I can balance a chemical equation. I can model and classify reactions. I can use models and identify patterns to predict the products of a chemical reaction. **Energy & Heat** I can create a model relating the amount of energy produced to the amount of reactant consumed.

PSCI.PS3.6 Determine the mathematical relationships among heat, mass, specific heat capacity, and temperature change using the equation Q = mCpΔT.	I can relate heat, mass, specific heat capacity, and temperature change.
PSCI.PS3.2 Plan and conduct an investigation to provide evidence that thermal energy will move as heat between objects of two different temperatures, resulting in a more uniform energy distribution (temperature) among the objects.	I can solve problems using Q = mCpΔT. I can design and carry out an investigation of the energy flow between objects of different temperatures. I can differentiate between temperature and thermal energy.
PSCI.PS3.8 Plan and conduct an experiment using a controlled chemical reaction to transfer thermal energy and/or do mechanical work.	I can plan and conduct an experiment that employs chemical energy.
<u>Energy and Phases of Matter</u>	**<u>Energy and Phases of Matter</u>**
PSCI.PS1.1 Using the kinetic molecular theory and heat flow considerations, explain the changes of state for solids, liquids, gases, and plasma.	I can explain phase changes in terms of energy flow and particle motion.
PSCI.PS1.2 Graphically represent and discuss the results of an investigation involving pressure, volume, and temperature of a gas.	I can draw and interpret graphs relating pressure, volume, or temperature of a gas. I can use experimental data to investigate the relationships between pressure, volume, and temperature of a gas. I can model the behavior of gases in terms of particle motion.