SC.PS:1 **Students will use mathematical representations and real life applications of the Law of Conservation of Momentum. (NGSS HS-PS: 2-2; NGSS HS-PS: 2-3)**

SC.PS:1-1	Identify the SI measuring units for length, time and mass, and determine which prefix to best include with these units when appropriate.
SC.PS:1-2	Define speed and use the GUESS problem solving method to calculate speed problems involving the variables distance and time.
SC.PS:1-3	Contrast instantaneous and average speed.
SC.PS:1-4	Define the two factors for momentum (mass and velocity) and elaborate on how each affects momentum.
SC.PS:1-5	Calculate momentum of an object in a closed system.
SC.PS:1-6	State the Law of Conservation of Momentum, explain this law in common terms and apply this law to predict the final velocity of an object in a system where a collision has occurred.
SC.PS:1-7	Explain the relationship between time, force, velocity and momentum and apply this relationship in collision conditions.
SC.PS:1-8	Apply an understanding of the momentum-impulse theorem when explaining the benefit of "following through" in sports.
SC.PS:1-9	Defend the need for safety features (crumple zones, air bags) using the momentum-impulse theorem.

SC.PS:2 Students will use mathematical representations and real life applications of Newton's Laws of Motion. (NGSS HS-PS: 2-1)

SC.PS:2-1	Define key components to Newton's Laws of Motion: mass, net force, acceleration, and inertia, and provide everyday examples of each.
SC.PS:2-2	Apply Newton's 1st Law of Motion to objects in motion or at rest; acknowledging no change will occur to velocity unless unbalanced forces act on them by making predictions.
SC.PS:2-3	Apply Newton's 2nd Law of Motion to an object experiencing unbalanced forces, and be able to compute either mass or rate of acceleration given the values of force involved (using the GUESS method).
SC.PS:2-4	Contrast the relationship between mass and acceleration (with net force constant), and between net force and acceleration (mass constant). This relationship should also be illustrated using values on a t-chart.
SC.PS:2-5	Contrast the changes in motion that takes place to falling objects in open and closed systems.
SC.PS:2-6	Defend the need for airbags in a car using Newton's 1st and 2nd Laws.
SC.PS:2-7	Provide examples of, and make predictions in compliance with, Newton's 3rd Law of Motion.
SC.PS:2-8	Investigate the relationship between unbalanced forces acting upon an object (immersed in a fluid, experiencing varying levels of friction, etc.) and the resulting motion.
SC.PS:2-9	Employ the steps of Scientific Method: describe a problem, identify its variables, formulate a hypothesis, and write a procedure for a controlled experiment that will solve the problem.
SC.PS:2-10	Plan and conduct an experiment maintaining controlled conditions.
SC.PS:2-11	Analyze experimental data and write an evidence-supported conclusion.

SC.PS:3 Students will create a computational model to analyze the change in energy of one component in a system, when the change in energy of the other component(s) and energy flows in and out of the system are known. (NGSS HS-PS 3-1; NGSS HS-PS 3-2)

SC.PS:3-1	Compare and contrast the major forms of energy.
SC.PS:3-2	Apply the GUESS problem-solving method in solving for the gravitational potential energy of objects in a system.
SC.PS:3-3	Apply the GUESS problem-solving method in solving for the kinetic energy of objects in a system.
SC.PS:3-4	Using the Law of Conservation of Energy, create a diagram illustrating changes in energy that take place to a swinging pendulum (or a ball on a halfpipe) in a closed system.
SC.PS:3-5	Define work and describe its effect on a system.
SC.PS:3-6	Define friction and describe its effect on a system.
SC.PS:3-7	Justify the need for the reduction of friction in an engine system.
SC.PS:3-8	Describe the conversions of energy that take place in real-life applications (batteries, wind turbines, combustion engines).
SC.PS:3-9	Design, build and refine a device that converts energy from one form to another. (e.g. Mousetrap Powered Car, Water Powered Elevator, Solar Powered Oven)

SC.PS:4 Students will 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. (NGSS HS-PS 1-1; NGSS HS-PS 1-8)

SC.PS:4-1	Describe the basic structure of an atom, and use information from the periodic table to create a two-dimensional atom model for a given element including such properties as number of protons, electrons, neutrons, ground state energy levels, as well as electron configuration.
SC.PS:4-2	Provide two examples of isotope pairs and explain what makes each an isotope.
SC.PS:4-3	Describe the role strong nuclear force and electric (Coulomb's) forces play in the stability of the nucleus.
SC.PS:4-4	Predict the product(s) that would result from each of the following processes of radioactive decay: alpha, beta, and gamma.
SC.PS:4-5	Simulate the idea of "half life" by conducting a statistical activity of elimination.
SC.PS:4-6	Apply an understanding of radioactive half-life by predicting the age of a sample given its change in isotopic composition.
SC.PS:4-7	Compare and contrast nuclear fission and nuclear fusion.
SC.PS:4-8	Compare and contrast the energy conversions associated with different types of electrical power plants (e.g. coal and nuclear).
SC.PS:4-9	Present the benefits and drawbacks of different energy sources (e.g. fossil fuels, solar, nuclear) by using current media.

SC.PS:5 Students will use mathematical representations and real life applications of the Laws of Thermodynamics. (NGSS HS-PS: 3-4)

SC.PS:5-1	Relate changes in thermal energy to temperature and thermal expansion.
SC.PS:5-2	Describe the spontaneous flow of heat, and relate this to the idea of objects "feeling warm" or "feeling cold."
SC.PS:5-3	State the first law of thermodynamics and provide a mathematically based example of how this law can be observed in everyday life.
SC.PS:5-4	Describe the significance of a material's specific heat capacity value.
SC.PS:5-5	Calculate thermal energy changes using calorimetry data.
SC.PS:5-6	Distinguish between the three methods of heat transfer: conduction, radiation and convection in terms of modality, and identify examples for each.
SC.PS:5-7	Describe the qualities that all effective thermal insulators have in common.
SC.PS:5-8	Describe how the specific heat of water affects the climate of a certain area. (e.g. Chicago lakefront, Iceland).
SC.PS:5-9	Clarify the 2nd law of thermodynamics by contrasting the use of an insulated cooler and refrigerator.
SC.PS:5-10	Investigate the effect of mass, temperature and composition on the flow of heat between materials.

SC.PS:6 Students will use mathematical representations to describe relationships among the properties of waves, including frequency, wavelength, energy, amplitude and speed of waves traveling in various media. (NGSS HS-PS 4-1; NGSS HS-PS 4-3)

SC.PS:6-1	Draw and label the different attributes of a wave (e.g. crest, rest position).
SC.PS:6-2	Identify the properties of a mechanical wave (period, frequency, wavelength, speed, and amplitude), and describe their mathematical relationship.
SC.PS:6-3	Define the properties of sound waves: pitch, intensity, loudness and identify contributing factors for each.
SC.PS:6-4	Identify the effect of medium composition and temperature on the speed of sound waves.
SC.PS:6-5	Describe the cause and resulting change in sound produced by the Doppler Effect.
SC.PS:6-6	Compare and contrast constructive and destructive interference of waves, and provide everyday examples of each.
SC.PS:6-7	Plan and conduct an experiment that investigates the effect of amplitude on wave speed and analyzes collected data.
SC.PS:6-8	Collaborate with classmates (using a different wave media) and further investigate what does and what does not affect wave speed.
SC.PS:6-9	Create a graphic organizer that displays the classification of wave types and examples.
SC.PS:6-10	Distinguish between the different parts of the electromagnetic spectrum, and identify how each type of wave is used.
SC.PS:6-11	Defend the claim that light behaves like a particle using the photoelectric effect.
SC.PS:6-12	Defend the claim that light is a wave using information on wave behavior. (reflection, refraction, diffraction, interference).

SC.PS:7 Students will use a model to describe how variations in the flow of energy into and out of Earth's systems, naturally occurring phenomena and human activity all result in changes in weather and climate. (NGSS HS-ES: 2-4; NGSS HS-ES: 3-5)

SC.PS:7-1	Describe the importance of the Earth's atmosphere and list the most abundant gases in the atmosphere.
SC.PS:7-2	Distinguish between the four vertical layers of the atmosphere in terms of temperature change and other key properties.
SC.PS:7-3	List factors that influence seasonal weather (e.g. earth's rotation, topography, solar radiation).
SC.PS:7-4	Summarize the sequence of energy transfer events that contribute to the warming and cooling of temperatures in the troposphere.
SC.PS:7-5	Plan and conduct an experiment that investigates the effect of carbon dioxide concentration on ambient temperature.
SC.PS:7-6	Identify the major factors that can influence the climate for a certain region (e.g. latitude, variation on solar radiation, winds, bodies of water)
SC.PS:7-7	Describe the role human activity has played in the changing of earth's climate.
SC.PS:7-8	Research a current issue dealing with major global climate change and present findings (e.g. acid rain, global warming, El Niño), and editorialize your findings.