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MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	**ICP.1.1** Develop graphical, mathematical, and pictorial representations (such as a motion map) that describe the relationship between the clock reading (time) and position of an object moving at a constant velocity and apply those representations to qualitatively and quantitatively describe the motion of an object.
	ICP.1.2 Describe the slope of the graphical representation of position vs. clock reading (time) in terms of the velocity of the object moving in one dimension.
	ICP.1.3 Distinguish between the terms "distance" and "displacement", and determine the value of either given a graphical or mathematical representation of position vs. clock reading (time).
	ICP.1.4 Distinguish between the terms "speed," "velocity," "average speed," and "average velocity" and determine the value of any of these measurements given either a graphical or mathematical representation.
MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects	**ICP.2.1** Develop graphical, mathematical, and pictorial representations (such as a motion map) that describe the relationship between the clock reading (time) and velocity of an object moving at a constant acceleration and apply those representations to qualitatively and quantitatively describe the motion of an object in terms of its change in position or velocity.
	ICP.2.2 Describe the differences between average velocity and instantaneous velocity and be able to determine either quantity given a graph of position vs clock reading (time).

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	ICP.2.3 For an object thrown vertically, qualitatively describe or quantitatively determine the velocity and acceleration at various positions during its motion.
	ICP.3.1 Develop pictorial and graphical representations which show that a single external applied force changes the velocity of an object, and that when no force acts, the velocity of an object remains constant.
	ICP.3.2 Construct force diagrams and combine forces to determine the equivalent single net force acting on the object when more than one force is acting on the object.
	ICP.3.3 Distinguish between forces acting on a body and forces exerted by the body. Categorize forces as contact forces, friction, or action at a distance (field) forces.
	ICP.3.4 Develop pictorial and graphical representations which show that a non-zero net force on an object results in an acceleration of the object and that the acceleration of an object of constant mass is proportional to the total force acting on it, and inversely proportional to its mass for a constant applied total force.
	ICP.3.5 Qualitatively describe and quantitatively determine the magnitude and direction of forces from observing the motion of an object of known mass.

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	ICP.3.6 Qualitatively describe and quantitatively determine the acceleration of an object of known mass from observing the forces acting on that object.
MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	**ICP.3.7** Develop pictorial and graphical representations which show that when two objects interact, the forces occur in pairs according to Newton's third law and that the change in motion of each object is dependent on the mass of each object.
	ICP.4.1 Define energy as a quantity that can be represented as being within a system that is distinct from the remainder of the universe and is measured in Joules.
	ICP.4.2 Identify forms of energy present in a system (kinetic, gravitational, elastic, etc.), and pictorially represent the distribution of energies, such as using pie or bar charts.
	ICP.4.3 Understand and explain that the total energy in a closed system is conserved.
	ICP.4.4 Qualitatively and quantitatively analyze various scenarios to describe how energy may be transferred into or out of a system by doing work through an external force or adding or removing heat.
	ICP.5.1 Develop pictorial representations which show that matter is made of particles.

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	ICP.5.2 Describe the assumptions used to develop the kinetic theory of gasses.
MS-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	**ICP.5.3** At the particle level, describe the relationship between temperature and the average kinetic energy of particles in the system and describe how a thermometer measures the temperature of a system.
	ICP.5.4 Distinguish "temperature" from "thermal energy," compare and contrast the Fahrenheit, Celsius, and Kelvin temperature scales, and convert temperatures between them.
	ICP.5.5 Evaluate graphical or pictorial representations that describe the relationship among the volume, temperature, and number of molecules and the pressure exerted by the system to qualitatively and quantitatively describe how changing any of those variables affects the others.
HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.	**ICP.5.6** Describe and demonstrate how the kinetic theory can be extended to describe the properties of liquids and solids by introducing attractive forces between the particles.
HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.	**ICP.5.7** Analyze a heating / cooling curve to describe how adding or removing thermal energy from a system changes the temperature or state of an object and be able to identify the melting and freezing temperatures of the system.
	ICP.5.8 Collect and use experimental data to determine the number of items in a sample without actually counting them and qualitatively relate this to Avogadro's hypothesis.

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	ICP.6.1 Distinguish between elements, mixtures, and compounds based on their composition and bonds and be able to construct or sketch particle models to represent them.
	ICP.6.2 Develop graphical and mathematical representations to show that mixtures can be made in any proportion and separated based on the properties of the components of the mixture and apply those representations to quantitatively determine the ratio of components.
	ICP.6.3 Cite the evidence that supports the idea that some pure substances are combined of elements in a definite ratio, as for example seen in electrolysis of water.
	ICP.6.4 Given the periodic table, determine the atomic mass, atomic number, and charges for any element.
HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.	**ICP.6.5** Given a periodic table, understand and describe the significance of column location for the elements by calculation of molar ratios of known compounds.
	ICP.6.6 Develop graphical and mathematical representations that describe the relationship between volume and mass of an object, describe the slope in terms of the object's density, and apply those representations to qualitatively and quantitatively determine the mass or volume of any object.
	ICP.6.7 Describe how both density and molecular structure are applicable in distinguishing the properties of gases from those of liquids and solids.

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	ICP.7.1 Pictorially or mathematically represent chemical changes using particle diagrams and chemical equations.
	ICP.7.2 Demonstrate the Law of Conservation of Matter in terms of atoms and mass of substances by balancing equations.
	ICP.7.3 Differentiate the basic types of reactions, for example: synthesis, decomposition, combustion, single replacement, and double replacement.
	ICP.7.4 Using balanced equations and stoichiometric calculations, demonstrate the principle of Conservation of Matter in terms of atoms and mass.
	ICP.8.1 Describe electrical current in terms of the motion of electrons within a device and relate the rate of motion of the electrons to the amount of current measured.
	ICP.8.2 Describe the relationship among voltage, current, and resistance for an electrical system consisting of a single voltage source and a single device.
	ICP.8.3 Describe on a macroscopic scale how any distribution of magnetic materials (e.g. iron filings, ferrofluid, etc.) aligns with the magnetic field created by a simple magnet.

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	ICP.9.1 Develop qualitative particle models of mechanical waves and explain the relationship of the particles and their interactions in transverse and longitudinal waves, as well as, how waves appear in nature as in water waves and tsunamis, ground waves in earth quakes, and sound waves.
	ICP.9.2 Develop and apply a simple mathematical model regarding the relationship among frequency, wavelength, and speed of waves in a medium as well.
MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials	**ICP.9.3** Qualitatively describe the reflection and transmission of a mechanical wave at either a fixed or free boundary or interface.
	ICP.9.4 Describe how interacting waves produce different phenomena than singular waves in a medium(e.g. periodic changes in volume of sound or resonance)
HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	**ICP.9.5** Describe and provide examples of how modern technologies use mechanical or electromagnetic waves and their interactions to transmit information.
	ICP.10.1 Describe and compare/contrast the atomic models suggested by Rutherford and Bohr.
	ICP.10.2 Describe the model of the atomic nucleus and explain how the nucleus stays together in spite of the repulsion between protons.
	ICP.10.3 Develop and apply simple qualitative models or sketches of the atomic nucleus that illustrate nuclear structures before and after undergoing fusion, fission, or radioactive decay.

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	ICP.10.4 Distinguish between fusion, fission, and radioactivity and qualitatively compare the amount of energy released in these processes.
	ICP.10.5 Explain the potential applications and possible consequences as the result of nuclear processes such as the generation of energy at nuclear power plants, including the potential damage that radioactivity can cause to biological tissues.