Core High School Physical Science
Standards, Supporting Skills, and Examples

Indicator 1: Describe structures and properties of, and changes in, matter

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
(Analysis)	**9-12.P.1.1. Students are able to use the Periodic Table to determine the atomic structure of elements, valence number, family relationships, and regions (metals, nonmetals, and metalloids).** • Determine protons, neutrons, electrons, mass number, and atomic number from the Periodic Table. • Determine the number of valence electrons for elements in the main (s&p) blocks of the Periodic Table. • Identify the relative metallic character of an element based on its location on the Periodic Table.
(Comprehension)	**9-12.P.1.2. Students are able to describe ways that atoms combine.** • Name and write formulas for binary ionic and covalent compounds. Example: sodium chloride (NaCl), carbon dioxide (CO_2) • Compare the roles of electrons in covalent, ionic, and metallic bonding. • Discuss the special nature of carbon covalent bonds.
(Application)	**9-12.P.1.3. Students are able to predict whether reactions will speed up or slow down as conditions change.** **Examples**: temperature, concentration, surface area, and catalysts
(Application)	**9-12.P.1.4. Students are able to balance chemical equations by applying the Law of Conservation of Matter.** • Trace number of particles in diagrams and pictures of balanced equations. Example: Write out an equation with symbols: $Mg + 2HCL \rightarrow MgCl_2 + 2H_2$

(Comprehension)	**9-12.P.1.5. Students are able to distinguish among chemical, physical, and nuclear changes.** • Differentiate between physical and chemical properties used to describe matter. • Identify key indicators of chemical and physical changes. • Describe the effects of changing pressure, volume, or temperature upon gases. • Identify characteristics of a solution and factors that affect the rate of solution formation. • Explain the differences among nuclear, chemical, and physical changes at the atomic level. Examples: solute, solvent, concentrated, dilute, saturated, unsaturated, supersaturated Factors affecting rate: agitation, heating, particle size, pictures of particles

Indicator 2: Analyze forces, their forms, and their effects on motions.

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
(Analysis)	**9-12.P.2.1. Students are able to apply concepts of distance and time to the quantitative relationships of motion using appropriate mathematical formulas, equations, and units.** • Evaluate speed, velocity, and acceleration both qualitatively and quantitatively. Examples: Identify the sign (+,-, 0) of an object's acceleration based on velocity information. Predict whether an object speeds up, slows down, or maintains a constant speed based on the forces acting upon it. Calculate acceleration using the equation $A_{avg}=\Delta V/\Delta t$. • Given distance and time, calculate the velocity or speed of an object. • Create and interpret graphs of linear motion. Example: Given a velocity-time or a distance-time graph with

	different slopes, determine the motion of an object. • Distinguish between velocity and acceleration as related to force.
(Application)	**9-12.P.2.2. Students are able to predict motion of an object using Newton's Laws.** • Describe how inertia is related to Newton's First Law. • Explain the effect of balanced and unbalanced forces. • Identify the forces at work on action/reaction pairs as distinguished from balanced forces. Examples: Draw a linear force diagram for the forces acting on an object in contact with another. Identify action/reaction pairs. • Explain how force, mass, and acceleration are related.
(Application)	**9-12.P.2.3. Students are able to relate concepts of force, distance, and time to the quantitative relationships of work, energy, and power.** • Apply appropriate mathematical formulas and equations to concepts using appropriate units. Examples: Calculate power given force, distance and time. Calculate work done on an object given force and distance.

Indicator 3: Analyze interactions of energy and matter.

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
(Application)	**9-12.P.3.1. Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of Conservation of Energy.** • Describe how energy can be transferred and transformed to produce useful work. Examples: Diagram simple energy transfers, describing the objects and the forms of energy gained and lost. Use simple machines as an example of the transmission

	of energy. • Given the formulas, calculate the mechanical advantage and efficiency of selected systems. • Explain methods of heat transfer. Examples: conduction, radiation, and convection
(Comprehension)	**9-12.P.3.2. Students are able to describe how characteristics of waves are related to one another.** • Relate wavelength, speed, and frequency ($v = f$). • Distinguish between transverse and longitudinal waves. Examples: Discuss changes in frequency of waves using the Doppler Effect. Compare the energy of different frequency ranges of waves with in the electromagnetic spectrum. Describe how different colors of light waves have different amounts of energy.
(Application)	**9-12.P.3.3. Students are able to describe electrical effects in terms of motion and concentrations of charged particles.** • Relate potential difference to current. • Describe how static electricity is different from current electricity. • Interpret and apply Ohm's Law. • Describe electrical attractions and repulsions. • Describe how magnetism originates from motion of charged particles.

Core High School Physical Science
Performance Descriptors

Advanced	**High school students performing at the advanced level:** • predict the type of bonds formed as elements combine; • balance chemical equations involving polyatomic ions; • analyze and solve a problem involving velocity, acceleration, force, work, energy, or power; • construct or design a model that illustrates the Law of Conservation of Energy to show energy changes from potential to kinetic in doing work; • describe electrical effects in terms of motion and concentrations of charged particles.
Proficient	**High school students performing at the proficient level:** • use the Periodic Table to determine the properties of elements and the ways they combine; • given a variable, predict whether reactions will speed up or slow down as conditions change; • balance simple chemical equations; • describe chemical, physical, and nuclear changes at the atomic and macroscopic levels; • calculate velocity, acceleration, force, work, energy, and power given the formulas; • given the forces acting on an object, predict its motion using Newton's Laws; • apply the Law of Conservation of energy to show energy changes from potential to kinetic in doing work; • describe how characteristics of waves are related to one another; • describe electrical effects in terms of motion and concentrations of charged particles.
Basic	**High school students performing at the basic level:** • use the Periodic Table to determine the properties of the 1st 18 elements; • provide the coefficients for an unbalanced synthesis or decomposition equation; • identify chemical and physical changes at the macroscopic level; • calculate velocity and force given the formulas; • given an example, identify which of Newton's Laws is illustrated; • identify the characteristics of waves; • identify electricity as movement of charged particles.

Core High School Physical Science
ELL Performance Descriptors

Proficient	**High school ELL students performing at the proficient level:** • read the Periodic Table to gather information about elements; • describe basic chemical and physical changes; • describe what a force is; • define the parts of waves; • recognize that electricity is movement of charged particles.
Intermediate	**High school ELL students performing at the intermediate level:** • read the Periodic Table; • recognize basic chemical and physical changes; • identify what a force is; • label parts of a wave; • turn a circuit on and off.
Basic	**High school ELL students performing at the basic level:** • know what the Periodic Table is; • observe physical changes in matter; • demonstrate a force; • recognize a wave; • identify usage of electricity in daily life.
Emergent	**High school ELL students performing at the emergent level:** • use correct pronunciation of science words; • use non-verbal communication to express scientific ideas.
Pre-emergent	**High school ELL students performing at the pre-emergent level**: • observe and model appropriate cultural and learning behaviors from peers and adults; • listen to and observe comprehensible instruction and communicate understanding non-verbally.