# HIGH SCHOOL
# Science
# PRIORITY STANDARDS

| Course(s) where this standard is applied | Performance Indicator Code | Performance Standards |
|---|---|---|
| Earth & Space Science | | |
| | | **HS.ESS1 Earth's Place in the Universe** |
| | HS.ESS1.1 | **Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.** [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] [Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.] |
| | HS.ESS1.5 | **Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.** [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).] |
| | | **HS.ESS2 Earth's Systems** |
| | HS.ESS2.1 | **Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.** [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.] |
| | HS.ESS2.6 | **Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.] |
| | | **HS.ESS3 Earth and Human Activity** |
| | HS.ESS3.1 | **Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.** [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.] |
| | HS.ESS3.2 | **Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*** [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.] |
| | HS.ESS3.4 | **Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.*** [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).] |

# HIGH SCHOOL
# Science
# PRIORITY STANDARDS

| Course(s) where this standard is applied | Performance Indicator Code | Performance Standards |
|---|---|---|
| | HS.ESS3.5 | **Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.**<br>[Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).]<br>[Assessment Boundary: Assessment is limited to one example of climate change and its associated impacts.] |
| | HS.ESS3.6 | **Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).**<br>[Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.]<br>[Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.] |
| **Engineering, Technology, and the Application of Science** | | |
| **HS.ETS1 Engineering Design** | | |
| | HS.ETS1.2 | **Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.** |
| | HS.ETS1.3 | **Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.** |
| **Life Science** | | |
| **HS.LS1 From Molecules to Organisms: Structures and Processes** | | |
| | HS.LS1.1 | **Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.**<br>[Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.] |
| | HS.LS1.2 | **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**<br>[Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.]<br>[Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.] |
| | HS.LS1.3 | **Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.**<br>[Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.]<br>[Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.] |
| | HS.LS1.6 | **Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.**<br>[Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.]<br>[Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.] |
| **HS.LS2 Ecosystems: Interactions, Energy, and Dynamics** | | |

# HIGH SCHOOL
# Science
# PRIORITY STANDARDS

| Course(s) where this standard is applied | Performance Indicator Code | Performance Standards |
|---|---|---|
| | HS.LS2.4 | **Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. ^**<br>[Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.]<br>[Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.] |
| | HS.LS2.5 | **Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. ^**<br>[Clarification Statement: Examples of models could include simulations and mathematical models.]<br>[Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.] |
| | | **HS.LS3 Heredity: Inheritance and Variation of Traits** |
| | HS.LS3.3 | **Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.**<br>[Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.]<br>[Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.] |
| | | **HS.LS4 Biological Evolution: Unity and Diversity** |
| | HS.LS4.4 | **Construct an explanation based on evidence for how natural selection leads to adaptation of populations.**<br>[Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.] |
| **Physical Science** | | |
| | | **HS.PS1 Matter and Its Interactions** |
| | 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.**<br>[Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.]<br>[Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.] |
| | 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** .<br>[Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.]<br>[Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.] |
| | HS.PS1.7 | **Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.**<br>[Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.]<br>[Assessment Boundary: Assessment does not include complex chemical reactions.] |
| | | **HS.PS2 Motion and Stability: Forces and Interactions** |
| | HS.PS2.1 | **Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.**<br>[Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.]<br>[Assessment Boundary: Assessment is limited to one- dimensional motion and to macroscopic objects moving at non-relativistic speeds.] |

# HIGH SCHOOL
# Science
# PRIORITY STANDARDS

| Course(s) where this standard is applied | Performance Indicator Code | Performance Standards |
|---|---|---|
| | HS.PS2.2 | **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.**<br>[Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.]<br>[Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.] |
| | | **HS.PS3 Energy** |
| | HS.PS3.1 | **Create a computational model to calculate the change in the 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.**<br>[Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.]<br>[Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.] |
| | HS.PS3.2 | **Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.**<br>[Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.] |
| | HS.PS3.3. | **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.***<br>[Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.]<br>[Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.] |
| | | **HS.PS4 Waves and Their Applications in Technologies for Info Transfer** |
| | HS.PS4.1 | **Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.**<br>[Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.]<br>[Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.] |