California Assessment of
Student Performance and Progress

California Alternate Assessment for Science Blueprint

Approved by the State Board of Education
on January 18, 2018

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1. Introduction

About the Assessment

The California Alternate Assessment (CAA) for Science, administered pursuant to California *Education Code* (*EC*) Section 60640(b)(2)(B), is part of the California Assessment of Student Performance and Progress (CAASPP) System. The CAA for Science measures the Core Content Connectors (Connectors) derived from the California Next Generation Science Standards (CA NGSS) and is administered to students with the most significant cognitive disabilities in grades five and eight and once in high school (i.e., grade ten, eleven, or twelve).

Development of the Connectors

The Connectors were developed in a multistage process, beginning in fall 2015 and involving California educators, Educational Testing Service assessment experts, and edCount. The goal was to represent the CA NGSS with appropriate levels of challenge and rigor for the targeted population of students. Although the Connectors represent alternate achievement standards, it is expected that they may pose a considerable academic challenge for many of the students in this population.

The Connectors are based on the performance expectations from the CA NGSS and were designed to incorporate the science and engineering practices, the disciplinary core ideas, and the crosscutting concepts that the CA NGSS comprise.

Using the Blueprint for Test Assembly

The CAA for Science blueprint documents how test forms will be assembled. Similar to the California Science Test, the CAA for Science takes into account the three-dimensional interrelationships of the CA NGSS performance expectations and the integration of the disciplinary core ideas, science and engineering practices, and crosscutting concepts. Where appropriate for the testing population, the CAA for Science measures Connectors with a multidimensional approach.

The test includes three science domains (Earth and Space Sciences, Life Sciences, and Physical Sciences) and one engineering domain (Engineering, Technology, and Application of Science). For scoring and reporting purposes, each of the three science domains will constitute one-third of the test—items written to assess Connectors associated with Engineering, Technology, and Application of Science will be assigned to one of the three science domains, depending on the context of their stimulus. California's Environmental Principles and Concepts also will provide context for item development, as appropriate to the three science domains.

The CAA for Science uses an embedded performance task (PT) design that permits test examiners to administer a set of test questions measuring two Connectors from one of the three science domains. Each embedded PT contains ten questions and is administered shortly after instruction related to the Performance Expectations. Students are scored on three embedded PTs, one from each science domain.

Using Connectors, the embedded PTs of the CAA for Science will sample six performance expectations for assessment each year. Although the CAA for Science blueprint is not intended to guide instruction, one of its goals is to sample Connectors broadly over time so instruction in a broad range of performance expectations will be true to the intentions of the CA NGSS and provide solid preparation for the CAA for Science.

2. California Alternate Assessment for Science Claim

The CAA for Science has one overall claim: "Students can demonstrate performance associated with the expectations described by the Core Content Connectors linked to the CA NGSS across the domains of Earth and Space Sciences, Life Sciences, Physical Sciences, and Engineering, Technology, and Application of Science."

3. California Alternate Assessment for Science Connectors Coverage

Seventy-two Connectors (i.e., 20 Connectors from grades three through five, 24 Connectors from grades six through eight, and 28 Connectors from high school grades nine through twelve) identified from the three science domains are identified as appropriate for assessment in the CAA for Science. In grade five and grade eight and once in high school, students will be assessed annually on six of these Connectors. Note that each assessment draws on Connectors from several grades. The grade five assessment draws from Connectors from grade three through five and also includes the foundational concepts that are addressed in kindergarten through grade two. The grade eight assessment draws on Connectors from grades six through eight and the high school assessment draws on Connectors from grades nine through twelve.

The Connectors have been evaluated by stakeholder groups and content experts to determine a rotation of the assessed Connectors.[1] While some Connectors are grade-specific, others are specific to a grade band. All of the rotating Connectors will be assessed over a five-year period, with some being assessed multiple times.

Test blueprint details are shown in Table 1. Connectors are listed in the appendix.

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[1] The CAA for Science is aligned with the Core Content Connectors (Connectors). The Connectors were derived from the CA NGSS through a process that included Educational Testing Service, edCount, and a committee of California stakeholders. The performance expectations from the CA NGSS domains of Life Science, Physical Science, and Earth and Space Science were each evaluated, and a Connector was developed for each of the performance expectations. The 11 Connectors for Engineering, Technology, and Application of Science will be incorporated into the 72 Connectors for the three science domains and are assessed within the context of the science domain Connectors. The CA NGSS can be found at https://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp. The Core Content Connectors can be found at https://www.cde.ca.gov/ta/tg/ca/altassessment.asp.

Table 1. Annual Blueprint (Applies to All Grades)

Domain	Connectors per Task	Low Complexity	Medium Complexity	High Complexity	Total Items
Life Science	2	4 items (4 points)	4 items (4–6 points)	2 items (2–4 points)	10 items (12 points)
Physical Science	2	4 items (4 points)	4 items (4–6 points)	2 items (2–4 points)	10 items (12 points)
Earth and Space Science	2	4 items (4 points)	4 items (4–6 points)	2 items (2–4 points)	10 items (12 points)
Total	6	12 items (12 points)	12 items (12–18 points)	6 items (6–12 points)	30 items (36 points)

Appendix A: Assessed Performance Expectations and Connectors

The tables in this appendix present the Core Content Connectors selected for assessment over a five-year period, along with their corresponding CA NGSS Performance Expectations. These Connectors are only the subset selected for assessment. A list of all the Connectors representing the full CA NGSS for instructional purposes can be found at https://www.cde.ca.gov/ta/tg/ca/documents/ngssaltconnectors.docx, along with the focal knowledge, skills, and abilities and the essential understandings that correspond to each Connector.

Figure 1 describes how to interpret the standards code associated with each performance expectation and connector assessed. The first alphanumeric indicator represents the grade level assessed, either grades three through five, middle school (MS) [i.e., grades six through eight], or high school (HS) [i.e., grade nine through twelve]. After the hyphen, the letters in the middle indicate the domain being assessed, either Earth and Space Sciences, Life Sciences, Physical Sciences, or Engineering, Technology, and Application of Science. The number before and after the final hyphen indicates the standard number for that grade and that domain.

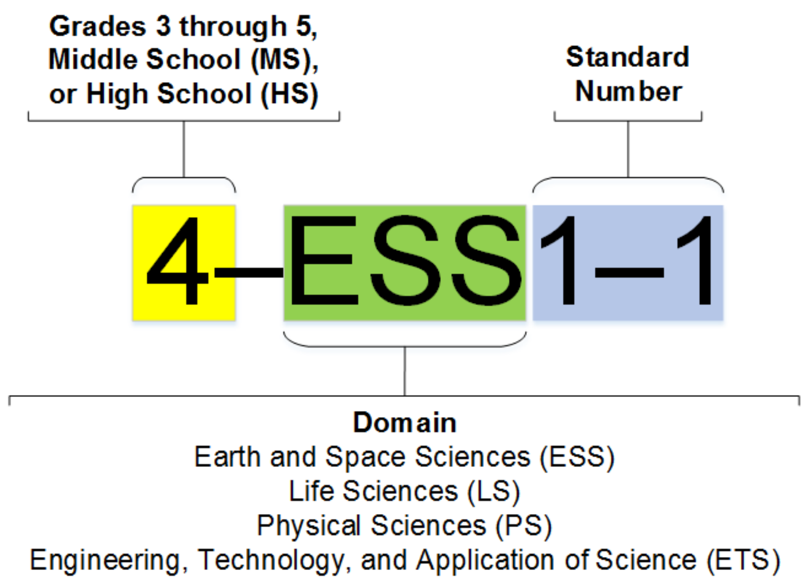

Figure 1. How to interpret standards codes in Table 2 through Table 4

Table 2. Performance Expectations and Connectors Included in Grade Five Assessment

Code	Performance Expectation	Connector
4-ESS1-1	Identify evidence from patterns in rock formations and fossils in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.	Identify patterns of fossils and rock formations that show how the Earth's surface has changed over time.
4-ESS2-2	Analyze and interpret data from maps to describe pattern of Earth's features.	Identify patterns of Earth's features on maps.
4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Identify and compare human solutions to reduce the impact of a natural Earth process (e.g., earthquake, flood, volcanic activity) on humans.
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	Use data to describe similarities and differences in the timing of observable changes in shadows, daylight, and the appearance of stars.
5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	Identify examples of ways the four major Earth systems interact to affect living things and the Earth's surface materials and processes.
5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	Recognize using data that the majority of water on Earth is found in the oceans as salt water and most of the Earth's fresh water is stored in glaciers.
5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Using provided information, identify ways people can help protect the Earth's resources and how that affects the environment.

Code	Performance Expectation	Connector
3-LS1-1	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	Identify a common pattern between models of different life cycles.
3-LS2-1	Construct an argument that some animals form groups that help members survive.	Recognize that animals within a group help the group obtain food for survival, defend themselves, and survive changes in their ecosystem.
3-LS3-1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Based on data through observation, identify similarities in the traits of a parent and the traits of an offspring and variations in similar traits in a grouping of similar organisms.
3-LS4-2	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	Using evidence, through observation, identify features and characteristics that enable an organism to survive in a particular environment.
4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Match internal and external structures of plants and animals (e.g., thorns, stems, roots, heart, stomach, lung, brain) to functions that support growth, survival, behavior, and reproduction of organisms.
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Identify a model that shows the movement of matter (e.g., plant growth, eating, composting) through living things.
3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	Identify through observation and demonstration ways to change the motion of an object (e.g., size or mass of the object, direction of forces).

Code	Performance Expectation	Connector
4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	Through observation of a model, identify that energy can be moved from place to place (e.g., by moving objects, through sound, light, or electric currents).
4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.	Identify the change in energy (e.g., speeds as objects interact) when objects collide.
4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	Recognize that an object can be seen when light reflected from its surface enters the eye.
5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.	Identify in a model (e.g., picture, diagram) that all matter can be broken down into smaller and smaller pieces until they are too small to be seen by human eyes.
5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	Recognize through observation that the total weight of matter is conserved by comparing the weight of an object before and after it changes from a liquid to a solid and from a solid to a liquid.
5-PS1-3	Make observations and measurements to identify materials based on their properties.	Classify through observation materials (e.g., shape, texture, buoyancy, color, magnetism, solubility) by physical properties.
3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	Define a simple design problem that can be solved with the development of a new or improved object, tool, or process, and identify the materials and the amount of time needed to develop a successful solution.
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	Compare two possible solutions to the same problem based on how well each is likely to meet the identified criteria (required features) and constraints (limits) for a successful solution.

Code	Performance Expectation	Connector
3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Carry out tests in which variables are controlled and failure points are considered to determine which solution best solves the problem.

Table 3. Performance Expectations and Connectors Included in Grade Eight Assessment

Code	Performance Expectation	Connector
MS-ESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	Use an Earth-sun-moon model to show that the Earth-moon system orbits the sun once an Earth year and the orbit of the Moon around Earth corresponds to a month.
MS-ESS2-1	Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.	Identify relationships between components in a model of energy flows and matter cycles within and among Earth’s systems, including the sun and Earth’s interior as primary energy sources.
MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Identify how air masses influence weather using data and/or simulated demonstrations.
MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	Use resources (e.g., maps, charts, images of natural hazards) to identify patterns in past occurrences of catastrophic events in each of two regions to predict which location may receive a future similar catastrophic event.
MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Use data from an existing design solution for minimizing a human impact on the environment to identify limitations of the use of technologies employed by the solution.

Code	Performance Expectation	Connector
MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	Using a variety of resources (e.g., tables, graphs, maps), identify whether changes made by humans to Earth's natural resources have impacted natural systems.
MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	Find evidence of the effects of human activities on changes in global temperatures over the past century by using a variety of resources (e.g., tables, graphs, maps of global and regional temperatures, data on atmospheric levels of gases [such as carbon dioxide and methane], data on rates of human activities).
MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	Identify that living things are made of one cell or many and different types of cells.
MS-LS1-2	Develop and use a model to describe the function of cell as a whole and ways parts of cells contribute to the function.	Identify the function of a cell as a whole and the function of a cell wall or cell membrane by using a model of a cell.
MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	Identify the outcome of the process of breaking down food molecules (e.g., sugar) as the release of energy, which can be used to support other processes within the organism.
MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	Identify examples of how sensory information sent to the brain is used immediately for behavior or stored as a memory.
MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Identify factors in a graph (including resources, climate, or competition) in an ecosystem that influence growth in populations of organisms.

Code	Performance Expectation	Connector
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	Describe examples of competitive, predatory, or symbiotic relationships by using models of interactions between organisms in an ecosystem.
MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	Using a model, identify energy transfer between producers, consumers, and decomposers in an ecosystem.
MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	Identify the outcome using evidence of changes in physical or biological components of an ecosystem to populations of organisms in that ecosystem.
MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Use a model, through observation, to identify that a variety of inherited traits passed from parents to offspring leads to differences in offspring (e.g., eye color, fur pattern, plant height).
MS-LS4-6	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits populations over time.	Use numerical data sets or graphical representations through observation that represent a proportional relationship between some change in the environment and corresponding changes in a population’s genetic variation over time.
MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	Using data provided through observation, identify evidence that proves a chemical reaction has taken place (e.g., change in color, gas is created, heat or light is given off or taken in).
MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	Identify or modify a device in which a chemical process releases or absorbs thermal energy.

Code	Performance Expectation	Connector
MS-PS2-1	Apply Newton’s third law to design a solution to a problem involving the motion of two colliding objects.	Through observation and demonstration, identify that when objects collide, the contact forces transfer energy and changes the objects’ motions.
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.	Recognize that a change in an object’s motion can be due to the mass of the object or the forces acting on the object by using data on the motion of the 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.	Describe how a change in distance changes the amount of potential energy stored in the system (e.g., carts at varying positions on a hill) by using models.
MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	Use information (e.g., graph, model) to identify a device (e.g., foam cup, insulated box) that either minimizes or maximizes thermal energy transfer (e.g., keeping liquids hot or cold).
MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	Identify how light waves, or sound waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, glass) by using a model.
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	Define a design problem that can be solved through consideration of criteria and constraints, potential impacts on people and the environment, and scientific or other issues that are relevant to the problem.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Use a systematic process to evaluate how well two different design solutions meet the criteria and constraints of the problem.

Code	Performance Expectation	Connector
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	Analyze data from tests to identify how aspects of two different design solutions can be modified or combined to create a better solution.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	Evaluate the data from various testing methods to modify a proposed object, tool, or process to optimize the design solution.

Table 4. Performance Expectations and Connectors Included in High School Assessment

Code	Performance Expectation	Connector
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.	Identify components of a model illustrating that the sun releases light and heat energy that eventually reaches Earth.
HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	Using a model, describe how Earth’s motion causes changes over time.
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.	Identify the relationship between the motion of continental plates and how materials of different ages are arranged on Earth’s surface.
HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems.	Identify relationships, using a model, of how the Earth’s surface is a complex and dynamic set of interconnected systems (e.g., geosphere, hydrosphere, atmosphere, biosphere).

Code	Performance Expectation	Connector
HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	Use a model of Earth to identify the motion of the mantle and its plates occurs primarily through thermal convection, which is primarily driven by radioactive decay within Earth's interior.
HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.	Observe and identify the effect of water on the Earth's materials and surface processes (e.g., stream transportation and deposition, erosion, frost wedging).
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.	Explain the cause-and-effect relationship between human activity (e.g., population size, where humans live, types of crops grown) and changes in the amounts of natural resources, the occurrence of natural hazards, or changes in climate using evidence.
HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	Compare models to determine the effects of a conservation strategy to manage natural resources and to sustain human society and plant and animal life.
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.	Use representations to identify the relationships among Earth systems and how those relationships are being modified due to human activity (e.g., increase in atmospheric carbon dioxide, increase in ocean acidification, effects on organisms in the ocean (coral reef), carbon cycle of the ocean, possible effects on marine populations).
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	Using model(s), identify that different systems of the body carry out essential functions (e.g., digestive system, respiratory system, circulatory system, nervous system).

Code	Performance Expectation	Connector
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	Identify how growth occurs when cells multiply (mitosis) by using a model.
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.	Identify a model that demonstrates how organisms take in matter (allowing growth and maintenance) and rearrange the atoms to make new structures in chemical reactions.
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	Use mathematical representations (e.g., trends, averages, graphs) to identify dependencies of an animal population on other organisms for food and their environment for shelter.
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	Using a graphical representation, identify the changes in the amount of matter or energy as it travels through an energy pyramid or food web.
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	Identify evidence supporting the outcome of group behavior (e.g., predation, life expectancy) on species' chances to survive and reproduce.
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	Identify a model showing evidence that parents and offspring may have different traits.
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.	Recognize that data can be used to determine that organisms with advantageous heritable traits will increase in proportion over a period of time.

Code	Performance Expectation	Connector
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	Analyze data to determine a potential solution to mitigate adverse impacts of human activity on biodiversity.
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.	Organize different materials based on properties of elements.
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.	Using a model, determine whether energy is released or absorbed in a chemical reaction system.
HS-PS1-8	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.	Identify changes in the composition of the center of an atom during a reaction.
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.	Recognize the relationship between an object’s acceleration and the force.
HS-PS2-3	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.	Evaluate a device designed to minimize force by comparing data (e.g., momentum, mass, velocity, force, time).
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	Recognize that different materials have different molecular structures and properties that determine different functioning (e.g., flexible, but durable) of the material.
HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy	Identify that the temperature of two different components, when combined, show uniform energy distribution.

Code	Performance Expectation	Connector
	distribution among the components in the system (second law of thermodynamics).	
HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.	Identify a model (e.g., drawing, diagram) that shows the cause-and-effect relationships between forces produced by electric or magnetic fields.
HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.	Recognize that electromagnetic radiation (e.g., a radio, microwave, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons.
HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	Describe how a device operates using the principles of wave behavior by identifying steps in a model that show how a device uses waves to transmit and capture information and transmit energy.
HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	Define a real-world problem or challenge (e.g., need for clean water, food, and energy sources) and identify solutions.
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.	Break down a real-world problem into smaller problems that can be approached systematically to solve.
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.	Describe the strengths and weaknesses of a solution to a real-world problem with respect to specific criteria and trade-offs, as well as possible social and cultural acceptability and environmental impacts.

Code	Performance Expectation	Connector
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	Use computer simulations to evaluate the impact of proposed solutions to a real-world problem to see which one is most efficient or economical.