Colorado Measures of Academic Success*

Science Assessment Framework (starting in 2024) Grade 11

*Based on 2020 Colorado Academic Standards

Concepts and skills explicitly identified in the Colorado Academic Standards (CAS) are the basis for the Colorado Measures of Academic Success (CMAS) assessment. CMAS Science Frameworks list the percentage representation and number of score points for each reporting category and standards area that appears on the summative assessments. The relative weight across reporting categories is based on the number and depth of the Evidence Outcomes within the reporting category The Frameworks also specify the Prepared Graduates, Grade Level Expectations, and Evidence Outcomes that are included on the state assessments. Each Prepared Graduate will be represented on the assessment each year.

Colorado's 2020 Science Standards support a three-dimensional model of science teaching and learning. Consistent with best practices for three-dimensional summative assessment, all items require integration of at least two dimensions, based on a grounding phenomenon for the item.   Many items incorporate all three dimensions, as outlined by the 2020 CAS.

The Three Dimensions of Science Teaching and Learning – High School 2020 Colorado Academic Standards

Disciplinary Core Ideas

The DCIs form the basis for the content that students are expected to know by the end of the grade band and are present in every item.

All Disciplinary Core Ideas (DCI) are included in the High School standards. They are listed below, with their numerical association as listed in the 2020 CAS Document.

Physical Science: Students know and understand common properties, forms, and changes in matter and energy.

PS1 Matter and Its Interactions

PS2 Motion and Stability: Forces and Interactions

PS3 Energy

PS4 Waves and Their Applications in Technologies for Information Transfer

Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.

LS1 From Molecules to Organisms: Structures and Processes

LS2 Ecosystems: Interactions, Energy, and Dynamics

LS3 Heredity: Inheritance and Variation of Traits

LS4 Biological Evolution: Unity and Diversity

Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space.

ESS1 Earth’s Place in the Universe

ESS2 Earth’s Systems

ESS3 Earth and Human Activity

Science and Engineering Practices

The Science and Engineering Practices (SEPs) in the CAS are interwoven within certain items, and all SEPs found in the High School standards are tested at or below grade level according to the SEP progressions.

All Science and Engineering Practices (SEPs) are included in the High School standards. They are listed below, with their numerical association as listed in the 2020 CAS Document.

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models

3. Planning and carrying out investigations

4. Analyzing and interpreting data

5. Using mathematics and computational thinking

6. Constructing explanations (for science) and designing solutions (for engineering)

7. Engaging in argument from evidence

8. Obtaining, evaluating, and communicating information

Cross Cutting Concepts

Crosscutting concepts (CCCs) have applications across all domains of science. As such, they are a way of linking the different domains of science. The CCCs in the CAS are interwoven within certain items. Each CCC found in the High school standards is assessed according to the CCC progressions.

All Cross Cutting Concepts (CCC) are included in the High School standards. They are listed below, with their numerical association as listed in the 2020 CAS Document.

1. Patterns. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.

2. Cause and effect: Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

3. Scale, proportion, and quantity. In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

4. Systems and system models. Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

5. Energy and matter: Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.

6. Structure and function. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

7. Stability and change. For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

Scenarios for Items

Items are driven by high-quality scenarios that are grounded in phenomena or problems. All scenarios are puzzling and intriguing and are explainable using grade appropriate integration of the three dimensions of the 2020 CAS. Scenarios are presented in three different ways: simulation clusters, static clusters, and standalone items.

Simulation Clusters: Students are presented with an interactive simulation of a science model or experiment and asked to manipulate the simulation to make sense of the phenomenon shown and answer multiple associated two or three dimensional questions using their knowledge of the 2020 CAS.

Static clusters: Students are presented with background information, models, images, graphs, tables, and additional media and asked engage with the material to make sense of the phenomenon described and answer multiple associated two or three dimensional questions using their knowledge of the 2020 CAS.

Standalone Items: Students are presented with a unique phenomenon asked to make sense of that phenomenon based on the information in the stimulus and answer the two or three dimensional question using their knowledge of the 2020 CAS.

Cluster scenarios comprise most of the assessment, as students are asked to make sense of a larger phenomenon and answer more questions associated with those scenarios. Standalone items are included only to target a small number of 2020 CAS Evidence Outcomes not represented in simulation and cluster scenarios, and these Evidence Outcomes rotate on an annual basis.

Item Types

Items associated with grounding phenomena are presented in three different ways.

Selected Response (Multiple Choice, Multiple Response, and Fill in the Blank): For multiple choice and multiple response items, students utilize information from the stimulus to make sense of the phenomenon and select a correct answer out of provided choices. For fill in the blank items, students utilize information from the stimulus to make sense of the phenomenon and type their answer in a blank box.

Technology-Enhanced (bar graph, drag and drop, inline choice, hot spot, and match table grid): Students utilize information from the stimulus to make sense of the phenomenon and show their answer using technology, such as by creating a bar graph. Drag and drop items require students to drag answer choices into correct answer bays. Inline choice items require students to select their answer from a drop-down menu to complete a sentence or sentences. Hot spot items require students to select the correct response from its' location in an image. Match table grid items require students to check checkboxes in cells to indicate a match between the column and row labels.

Constructed Response: Students utilize information from the stimulus to make sense of the phenomenon and construct an open-ended response.

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
1	**Physical Science**	**36**	**10-11**	**3-4**
	Prepared Graduate 1. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding structure, properties and interactions of matter.			
	Grade Level Expectation: HS.1.1 The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter. **Evidence Outcomes:** a. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy levels of atoms. (HS-PS1-1) b. 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. (HS-PS1-3) c. 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. (HS-PS1-4) **Grade Level Expectation: HS.1.2 Chemical processes, their rates, their outcomes, and whether or not energy is stored or released can be understood in terms of collisions of molecules, rearrangement of atoms, and changes in energy as determined by properties of elements involved.** **Evidence Outcomes:** a. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (HS-PS1-2) b. 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. (HS-PS1-4) c. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. (HS-PS1-5)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	d. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. (HS-PS1-6)			
	Prepared Graduate 2. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding interactions between objects and within systems of objects.			
	Prepared Graduate 3. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how energy is transferred and conserved.			
	Prepared Graduate 4. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how waves are used to transfer energy and information.			
	Grade Level Expectation: HS.1.4 Newton's second law and the conservation of momentum can be used to predict changes in the motion of macroscopic objects. **Evidence Outcomes:** a. 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. (HS-PS2-1) b. 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. (HS-PS2-2) c. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. (HS-PS2-3) **Grade Level Expectation: HS.1.5 Forces at a distance are explained by fields that can transfer energy and can be described in terms of the arrangement and properties of the interacting objects and the distance between them.** **Evidence Outcomes:** a. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. (HS-PS2-4)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	b. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. (HS-PS2-5) c. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. (HS-PS2-6) **Grade Level Expectation: HS.1.6 Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system.** **Evidence Outcomes:** a. 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. (HS-PS3-1) b. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects). (HS-PS3-2) c. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (HS-PS3-3) **Grade Level Expectation: HS.1.7 Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.** **Evidence Outcomes:** a. 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. (HS-PS3-1) b. 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 distribution among the components in the system (second law of thermodynamics). (HS-PS3-4)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	Grade Level Expectation: HS.1.8 Force fields (gravitational, electric, and magnetic) contain energy and can transmit energy across space from one object to another. **Evidence Outcomes:** a. 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. (HS-PS3-5) **Grade Level Expectation: HS.1.9 Although energy cannot be destroyed, it can be converted to less useful forms as it is captured, stored and transferred.** **Evidence Outcomes:** a. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (HS-PS3-3) b. 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 distribution among the components in the system (second law of thermodynamics). (HS-PS3-4)			
	Grade Level Expectation: HS.1.10 Waves have characteristic properties and behaviors. **Evidence Outcomes:** a. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. (HS-PS4-1 b. Evaluate questions about the advantages of using a digital transmission and storage of information. (HS-PS4-2) **Grade Level Expectation: HS.1.11 Both an electromagnetic wave model and a photon model explain features of electromagnetic radiation broadly and describe common applications of electromagnetic radiation.** **Evidence Outcomes:** a. 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. (HS-PS4-3)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	**Standalone**
	b. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (HS-PS4-4) c. 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. (HS-PS4-5) **Grade Level Expectation: HS.1.12 Designed technologies can transmit digital information as wave pulses. Multiple technologies that are part of everyday experiences are based on waves and their interactions with matter.** **Evidence Outcomes:** a. 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. (HS-PS4-5)			
2	**Life**	**33**	**10-11**	**3-4**
	Prepared Graduate 5. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how individual organisms are configured and how these structures function to support life, growth, behavior and reproduction.			
	Prepared Graduate 6. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how living systems interact with the biotic and abiotic environment.			
	Grade Level Expectation: HS.2.1 DNA codes for the complex hierarchical organization of systems that enable life's functions. **Evidence Outcomes:** a. 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. (HS-LS1-1) b. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2) c. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	Grade level Expectation: HS.2.2 Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types. **Evidence Outcomes:** a. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (HS-LS1-4) **Grade level Expectation: HS.2.3 Organisms use matter and energy to live and grow.** **Evidence Outcomes:** a. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (HS-LS1-5) b. 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. (HS-LS1-6) c. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (HS-LS1-7) **Grade Level Expectation: HS.2.4 Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.** **Evidence Outcomes:** a. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (HS-LS2-1) b. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (HS-LS2-2) **Grade Level Expectation: HS.2.5 Matter and energy necessary for life are conserved as they move through ecosystems.** **Evidence Outcomes:** a. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. (HS-LS2-3)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	b. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (HS-LS2-4) c. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (HS-LS2-5) **Grade Level Expectation: HS.2.6 A complex set of interactions determine how ecosystems respond to disturbances.** **Evidence Outcomes:** a. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (HS-LS2-6) b. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (HS-LS2-7) **Grade Level Expectation: HS.2.7 Organisms interact in groups to benefit the species.** **Evidence Outcomes:** a. Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. (HS-LS2-8)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	Prepared Graduate 7. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how genetic and environmental factors influence variation of organisms across generations.			
	Prepared Graduate 8. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how natural selection drives biological evolution accounting for the unity and diversity of organisms.			
	Grade Level Expectation: HS.2.8 The characteristics of one generation are dependent upon the genetic information inherited from previous generations. **Evidence Outcomes:** a. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (HS-LS3-1) **Grade Level Expectation: HS.2.9 Variation between individuals results from genetic and environmental factors.** **Evidence Outcomes:** a. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (HS-LS3-3) b. 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. (HS-LS3-2) **Grade Level Expectation: HS.2.10 Evidence of common ancestry and diversity between species can be determined by examining variations including genetic, anatomical and physiological differences.** **Evidence Outcomes:** a. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (HS-LS4-1)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	Grade Level Expectation: HS.2.11. Genetic variation among organisms affects survival and reproduction. **Evidence Outcomes:** a. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (HS-LS4-2) b. 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. (HS-LS4-3) **Grade Level Expectation: HS.2.12 The environment influences survival and reproduction of organisms over multiple generations.** **Evidence Outcomes:** a. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (HS-LS4-4) b. Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (HS-LS4-5) **Grade Level Expectation: HS.2.13 Humans have complex interactions with ecosystems and have the ability to influence biodiversity on the planet.** **Evidence Outcomes:** a. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. (HS-LS4-6)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
3	**Earth and Space Science**	**31**	**10-11**	**2-3**
	Prepared Graduate 9. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding the universe and Earth's place in it.			
	Grade Level Expectation: HS.3.1 All stars, including the sun, undergo stellar evolution, and the study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. **Evidence Outcomes:** a. 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. (HS-ESS1-1) b. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. (HS-ESS1-2) c. Communicate scientific ideas about the way stars, over their life cycle, produce elements. (HS-ESS1-3) **Grade Level Expectation: HS.3.2 Explanations of and predictions about the motions of orbiting objects are described by the laws of physics.** **Evidence Outcomes:** a. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. (HS-ESS1-4) **Grade Level Expectation: HS.3.3 The rock record resulting from tectonic and other geoscience processes as well as objects from the solar system can provide evidence of Earth's early history and the relative ages of major geologic formations.** **Evidence Outcomes:** a. 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. (HS-ESS1-5 b. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. (HS-ESS1-6)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	Prepared Graduate 10. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how and why Earth is constantly changing.			
	Prepared Graduate 11. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how human activities and the Earth's surface processes interact.			
	Grade Level Expectation: HS.3.4 Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes, and these effects occur on different time scales, from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. **Evidence Outcomes:** a. 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. (HS-ESS2-1) b. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (HS-ESS2-2) c. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. (HS-ESS2-3) d. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. (HS-ESS2-4) **Grade Level Expectation: HS.3.5 Plate tectonics can be viewed as the surface expression of mantle convection, which is driven by heat from radioactive decay within Earth's crust and mantle.** **Evidence Outcomes:** a. 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. (HS-ESS2-1) b. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. (HS-ESS2-3)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	Grade Level Expectation: HS.3.6 The planet's dynamics are greatly influenced by water's unique chemical and physical properties. **Evidence Outcomes:** a. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (HS-ESS2-5) **Grade Level Expectation: HS.3.7 The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundation for the global climate system. Global climate models are used to predict future changes, including changes influenced by human behavior and natural factors.** **Evidence Outcomes:** a. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (HS-ESS2-2) b. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. (HS-ESS2-4) c. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (HS-ESS2-6) **Grade Level Expectation: HS.3.8. The biosphere and Earth's other systems have many interconnections that cause a continual co-evolution of Earth's surface and life on it.** **Evidence Outcomes:** a. Construct an argument based on evidence about the simultaneous co-evolution of Earth's systems and life on Earth. (HS-ESS2-7) **Grade Level Expectation: HS.3.9 Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.** **Evidence Outcomes:** a. 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. (HS-ESS3-1)			

*Based on 2020 Colorado Academic Standards

Reporting Category	Colorado Measures of Academic Success (as of 2024) Science Assessment Framework* Grade 11	% of Total Test Score Points	Points	
			Cluster (Simulation and Static)	Standalone
	b. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. (HS-ESS3-2) **Grade Level Expectation: HS.3.10 Natural hazards and other geological events have shaped the course of human history at local, regional, and global scales.** **Evidence Outcomes:** a. 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. (HS-ESS3-1) **Grade Level Expectation: HS.3.11 Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.** **Evidence Outcomes:** a. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. (HS-ESS3-3) b. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. (HS-ESS3-4)			
4	**Science and Engineering Practices (SEP)**	**65-74**		
All Standards	**Item Types**			
	Selected Response and Technology Enhanced Items	**52**	**15-18**	**4-7**
	Constructed Response Items	**48**	**14-16**	**4-6**
Total		**100**	**31-32**	**10-11**

*Based on 2020 Colorado Academic Standards