Colorado Alternate Assessment

(Based on the 2020 Colorado Academic Standards)

Science Assessment Framework (starting in 2023) Middle School

Concepts and skills explicitly identified in the Colorado Academic Standards (CAS) are the basis for the Colorado Alternate Assessment (CoAlt) assessment. CoAlt Science Frameworks list the percentage representation and number of score points for each standards area that appears on the summative assessments. The relative weight across standards is based on the number and depth of the Evidence Outcomes within the standard. The Frameworks also specify the Prepared Graduates, Grade Level Expectations, and Extended 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. Items on the Colorado Alternate Assessment may be one, two or three dimensional.

The Three Dimensions of Science Teaching and Learning – Middle School 2020 Colorado Academic Standards with Extended Evidence Outcomes

Disciplinary Core Ideas

The Disciplinary Core Ideas (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 are included in the Middle School standards. They are listed below, with their numerical association as listed in the 2020 Colorado Extended Evidence Outcomes 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 Middle School standards are tested according to the SEP progressions.

All Science and Engineering Practices are included in the Middle School standards. They are listed below, with their numerical association as listed in the 2020 Colorado Extended Evidence Outcomes 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 Middle School standards is assessed according to the CCC progressions.

All Cross Cutting Concepts are included in the Middle School standards. They are listed below, with their numerical association as listed in the 2020 Colorado Extended Evidence Outcomes 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 Extended Evidence Outcomes. Scenarios are presented in two different ways: clusters, and standalone items.

Clusters: Students are presented with background information and still images and asked to make sense of the phenomenon described using their knowledge of the 2020 CAS Extended Evidence Outcomes. The first item in the cluster will have three answer options and be one dimensional testing the DCI only. The second item in the cluster will typically have three answer options and be two dimensional. The third item in the cluster will have four answer options and be three dimensional.

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

Cluster scenarios comprise the majority 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 Extended Evidence Outcomes not represented in cluster scenarios, and these Extended Evidence Outcomes rotate on an annual basis.

Item Types

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

Selected Response (3SR): For multiple choice items, students utilize information from the stimulus to make sense of the phenomenon and select a correct answer out of 3 or 4 provided choices.

Supported Performance Tasks (SPT): require students to complete a chart or graphic. Students use option cards to respond to three related prompts for each item. Students may manipulate the option cards independently or indicate the desired placement to the Test Administrators through their preferred mode of expressive communication, such as verbal direction or eye gaze. This item type allows students to demonstrate their knowledge and skills to create a product, revealing a different level of understanding of specific concepts and skills than that which are demonstrated through Selected Response items alone.

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
Physical Science	**38**	**15**	**3**
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: MS.1.1 The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter and phases changes. **Extended Evidence Outcomes:** a Create models of simple molecules and more complex structures such as water, oxygen, methane, etc. Models can include drawings, 3D ball and stick structures, or computer representations showing different molecules. b. Analyze data to identify the similarities and differences of the properties of a substance before and after a chemical change (i.e.: wood burning, bake cake, burning sugar, vinegar & baking soda, Mentos/coke). c. Use information to identify natural resources that are transformed to make new, synthetic materials (e.g., vitamin D is found in nature but as a pill form it is synthetic). d. Create a model to explain the relationship that happens when changes in temperature change the state of a pure substance (i.e., hot air balloon, why do balloons inflate/deflate, states of water). **Grade Level Expectation: MS.1.2 Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.** **Extended Evidence Outcomes:** a. Use graphical displays to identify similarities and differences of the properties of a substance before and after a chemical change. b Create a model to describe how atoms do not change in a chemical reaction, they are just rearranged (E.g. turning wood into ash, baking a cake, etc). i. Reflects the law of conservation of mass. c. Engage in a task to construct, test, or modify a device that either releases or absorbs thermal energy by chemical processes (e.g., wood burning, bake a cake, clothing as insulation, solar panels, solar ovens).			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
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.			
Grade Level Expectation: MS.1.3 Motion is described relative to a reference frame that must be shared with others and is determined by the sum of the forces acting on it. The greater the mass of the object, the greater the force needed to achieve the same change in motion. **Extended Evidence Outcomes:** a. Engage in an exploration to design a solution to reduce the impact of a collision of two objects in motion or one in motion and one stationary (e.g., two cars). b. Engage in an investigation that provides evidence that objects with greater mass and greater force will change more than those with less mass and force. **Grade Level Expectation: MS.1.4 Forces that act a distance (gravitational, electric, and magnetic) can be explained by force fields that extend through space and can be mapped by their effect on a test object.** **Extended Evidence Outcomes:** a. Provide evidence, using an investigation to determine factors that affect the strength of electromagnetic forces (e.g., a model that demonstrates that a piece of metal when magnetized by electricity, can pick up many times its own weight). b. Construct a graph, model, or visual representation to show evidence of gravitational forces on interacting objects of different mass. Examples of evidence for arguments could include data generated from simulations or digital tools. c. Conduct or participate in an investigation to explore evidence that fields exist between objects exerting forces on each other even though the objects are not in contact (e.g., electrically charged strips of tape, balloon/hair). i.Charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.			
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.			
Grade Level Expectation: MS.1.5 Kinetic energy can be distinguished from the various forms of potential energy. **Extended Evidence Outcomes:** a. Use graphical displays of data to identify the relationship of the kinetic energy to the mass of an object and the speed of an object.			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
b. Create a model to demonstrate that when the position of objects interacting at a distance changes, different amounts of potential energy are stored in the system. c. Compare data 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). d. Provide evidence of energy transfer as measured by change in temperature between different types and masses of materials. e. Using data from a sample in an investigation, provide evidence of the transfer of energy between two objects, as measured by temperature. **Grade Level Expectation: MS.1.6 Energy changes to and from each type can be tracked through physical or chemical interactions. The relationship between the temperature and the total energy of a system depends on the types, states and amounts of matter.** **Extended Evidence Outcomes:** a. Engage in a task to construct, test, or modify a device to minimize or maximize thermal energy transfer from one object to another (i.e., identify devices that retain and/or lose heat). b Demonstrate understanding that the relationship between the energy transferred, they type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample (e.g., measure temperature when heat applied to water and ice added to water). c. Create or use a diagram to show evidence of kinetic energy transfer from one object or another (i.e., roller coaster from its peak to rest of track showing changes in kinetic energy; ball hitting another in pool and transferring energy to the ball that was hit). **Grade Level Expectation: MS.1.7 When two objects interact, each one exerts a force on the other that can cause energy to be transferred to and from the object.** **Extended Evidence Outcomes:** a. Create a model to demonstrate that when the position of objects interacting at a distance changes, different amounts of potential energy are stored in the system.			

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		3SR	SPT
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: MS.1.8 A simple wave model has a repeating pattern with specific wavelength, frequency, and amplitude and mechanical waves need a medium through which they are transmitted. This model can explain many phenomena which include light and sound. **Extended Evidence Outcomes:** a. Use a visual representation, simple graph or table to show how the amplitude (strength/intensity) of a wave is related to the energy in the wave. b. Use multiple representations to demonstrate how light or sound waves are reflected, absorbed or transmitted through various materials (e.g., water, air, glass). **Grade Level Expectation: MS.1.9 A wave model of light is useful to explain how light interacts with objects through a variety of properties.** **Extended Evidence Outcomes:** a Use multiple representations to demonstrate how light or sound waves are reflected, absorbed or transmitted through various materials (e.g., water, air, glass). **Grade Level Expectation: MS.1.10 Designed technologies can transmit digital information as wave pulses.** **Extended Evidence Outcomes:** a. Explore how waves can be used for communication purposes and to support the claim that digitized signals are a more reliable way to encode and transmit information (e.g., radio, television, cell-phones, and computers) in order to determine that digitized signals are more reliable for transmitting information.			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
Life Science	**31**	**12**	**3**
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.			
Grade Level Expectation: MS.2.1 All living things are made up of cells, which is the smallest unit that can be said to be alive. **Extended Evidence Outcomes:** a. Use evidence from an investigation to show that living things are made of cells. b Develop or use a model to identify at least three major components of a plant or animal cell (e.g., nucleus, cell membrane/cell wall, and cytoplasm) and the primary role of each component. c. Use evidence that shows the major organs that make up specific systems (e.g., respiratory, circulatory, and digestive), interact, and are composed of cells. **Grade level Expectation: MS.2.2 Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.** **Extended Evidence Outcomes:** a. Identify how characteristic animal behaviors and specialized plant structure help them survive and reproduce in a given environment (e.g., birds build a nest to protect young from cold, animals scatter pollen and seeds increasing the chance of plant reproduction). b. Collect data and construct a response to show different environmental factors influence growth of organisms (e.g., availability of food, light, space and water). **Grade level Expectation: MS.2.3 Sustaining life requires substantial energy and matter inputs.** **Extended Evidence Outcomes:** a. Identify how photosynthesis plays a role in the cycling of matter and the flow of energy between plants and animals (e.g., energy from the sun helps create food for plants and an animal eats the plant and gains energy from eating that plant). b. Develop or use a model to show how food supports growth and/or releases energy in an organism.			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
Grade level Expectation: MS.2.4 Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. **Extended Evidence Outcomes:** a. Gather information about how organisms detect, process, and use information via the nervous system for immediate use or to store information as a memory (e.g., predator/prey relationships; growth, reproduction, and survival).			
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: MS.2.5 Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving. **Extended Evidence Outcomes:** a. Use data to identify how environmental conditions such as resource availability can affect organisms and populations in an ecosystem. b. Identify examples of competitive, predatory, and mutually beneficial relationships between organisms in at least three different ecosystems (e.g., urban, tundra, mountain, plains). **Grade Level Expectation: MS.2.6. Ecosystems are sustained by the continuous flow of energy, originating primarily from the sun, and the recycling of matter and nutrients within the system.** **Extended Evidence Outcomes:** a. Develop or use a model (e.g., food web) to show how matter and energy are cycled among living and nonliving parts of an ecosystem. **Grade Level Expectation: MS.2.7. Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem.** **Extended Evidence Outcomes:** a. Identify examples of how changes to a physical or biological components of an ecosystem impact populations (e.g., eliminating an animal's food source). b. Compare the economic costs or social considerations of two design solutions for maintaining the health of an ecosystem (e.g., prevention of soil erosion, water purification).			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
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: MS.2.8. Heredity explains why offspring resemble, but are not identical to, their parents and is a unifying biological principle. Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes. **Extended Evidence Outcomes:** a. Develop a model of how structural changes to genes (mutations) may result in harmful, beneficial, or neutral effects for an organism (e.g., a fur on a brown bear vs. fur on a polar bear due to climate differences). b. Develop a model to show how the genetic characteristics of asexual and sexual reproduction of one generation relate to the previous generation (e.g., sweet potato cutting, bacteria, animals). **Grade Level Expectation: MS.2.9 Fossils are mineral replacements, preserved remains, or traces of organisms that lived in the past.** **Extended Evidence Outcomes:** a. Identify at least three examples of patterns in the fossil record that show changes in the level of complexity of anatomical structures in organisms and/or the chronological order of fossil appearance in the rock layers (e.g., change in the size of mammals' heads over time; arms of humans and horses share the same overall structure). b. Use scientific information to identify examples how the similarities and differences among modern organisms and fossil organisms lead to explanations of evolutionary relationships. c. Use pictorial or object data to compare embryonic development patterns across multiple species. **Grade Level Expectation: MS.2.10 Genetic variations among individuals in a population give some individuals an advantage in surviving and reproducing in their environment.** **Extended Evidence Outcomes:** a. Identify how variations of traits in populations increase some individuals' probability of surviving and reproducing.			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
c. Explore the relationship between natural selection and the increase and decrease of specific traits in populations over time (e.g., insect camouflage providing protection from a predator resulting in a larger population of that insect). **Grade Level Expectation: MS.2.11. Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions.** **Extended Evidence Outcomes:** a. Explore the relationship between natural selection and the increase and decrease of specific traits in populations over time (e.g., insect camouflage providing protection from a predator resulting in a larger population of that insect). **Grade Level Expectation: MS.2.12. Biodiversity is the wide range of existing life forms that have adapted to the variety of conditions on Earth, from terrestrial to marine ecosystems.** **Extended Evidence Outcomes:** a. Compare the economic costs or social considerations of two design solutions for maintaining the health of an ecosystem (e.g., prevention of soil erosion, water purification).			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
Earth and Space Science	**31**	**12**	**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: MS.3.1 Motion is predictable in both solar systems and galaxies. **Extended Evidence Outcomes:** a. Use a model of Earth-sun-moon system to show the cyclic patterns of the moon's common phases and seasons. b. Use a model to demonstrate the role of gravity in the motion of the Earth. **Grade Level Expectation: MS.3.2 The solar system contains many varied objects held together by gravity. Solar system models explain and predict eclipses, lunar phases, and seasons.** **Extended Evidence Outcomes:** a. Use a model to demonstrate the role of gravity in the motion of the Earth. b. Use data to determine at least one similarity and one difference among solar system objects (e.g., statistical information, drawings and photographs, models). c. Develop or use a model of the Earth-sun-moon system to identify the different cyclic patterns of lunar phases, eclipses of sun and moon, and seasons.			
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: MS.3.3 Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history. **Extended Evidence Outcomes:** a. Identify evidence that supports the scientific explanation that rock strata can be used to establish relative ages in the Earth's history. **Grade Level Expectation: MS.3.4 Energy flows and matter cycles within and among Earth's systems, including the sun and Earth's interior as primary energy sources. Plate tectonics is one result of these processes.** **Extended Evidence Outcomes:** a. Use a model to show that energy from the sun and the Earth's hot interior act together to form minerals and rocks (i.e., melting, crystallization, weathering, deformation, sedimentation).			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
b. Use scientific resources to describe the processes, both fast and slow, that have changed over Earth's surface over time (e.g., floods, landslides, earthquakes, plate movements). **Grade Level Expectation: MS.3.5 Plate tectonics is the unifying theory that explains movements of rocks at Earth's surface and geological history.** **Extended Evidence Outcomes:** a. Use data on the shape of continents, ocean structure (ridges, fracture zones, and trenches) and distribution of fossils to represent the past plate motions. **Grade Level Expectation: MS.3.6 Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features.** **Extended Evidence Outcomes:** a. Explain the fast and slow processes that have changed Earth's surface over time (e.g., floods, landslides, earthquakes, plate movement to create mountains, volcanos) with an emphasis on changes at the local level. b. Use a model to show how water changes its state as it moves through the hydrologic cycle. c. Use data to show how the motion and interaction of air masses explain changes in weather conditions. d. Use a model to identify Earth's tilt, seasons, elevation, and proximity to oceans as factors that determine a location's climate. **Grade Level Expectation: MS.3.7 Complex interactions determine local weather patterns and influence climate, including the role of the ocean.** **Extended Evidence Outcomes:** a. Collect or use data to demonstrate how motions and interactions of air masses change weather conditions (i.e., temperature, pressure, condensation, humidity, tornado, weather maps). i. What causes severe weather? b. Develop or use a model to identify different regional climates related to Earth's rotation and unequal heating (i.e., Coriolis Effect, latitude, longitude, and landforms).			

Colorado Academic Standards 2020 with Extended Evidence Outcomes Alternate Assessment (CoAlt) Science Grade 8	% of Total Test Score Points	Targeted Points	
		3SR	SPT
Grade Level Expectation: MS.3.8 Humans depend on Earth's land, ocean, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes. **Extended Evidence Outcomes:** a. Use scientific resources to show evidence of how Earth's resources are limited and uneven as a result of geoscience processes (e.g., petroleum, soil location). **Grade Level Expectation: MS.3.9 Mapping the history of natural hazards in a region and understanding related geological forces.** **Extended Evidence Outcomes:** a. Use data to show how some natural hazards can be predicted, prepared for, and mitigated. **Grade Level Expectation: MS.3.10 Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things.** **Extended Evidence Outcomes:** a. Identify an environmental problem caused by humans and generate a hypothesis as a solution to minimize its impact (e.g., conserve, reuse, or recycle resources). b. Use data to show at least two effects increases in human population and the use of natural resources impact Earths systems.			
	100	**39**	**9**

Item Types	% of Total Test Score Points	Targeted Points
3SR	**81**	**39**
SPT	**19**	**9**
	100	**48**