Colorado Measures of Academic Success

(Based on the 2020 Colorado Academic Standards)

Science Assessment Framework (starting in 2023) Grade 5

Concepts and skills explicitly identified in the Colorado Academic Standards (CAS) are the basis for the Colorado Measures of Academic Success (CMAS) assessments. Teaching to the CAS with fidelity is the best preparation for the CMAS assessments. 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 – Grade 5 2020 Colorado Academic Standards

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 level and are present in every item.

Not all DCIs are included in the Grade 5 standards. Those which are included in Grade 5 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

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

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 grade 5 standards are tested at grade level according to the SEP progressions.

Not all SEPs are included in the Grade 5 standards. Those which are included in Grade 5 are listed below, with their numerical association as listed in the 2020 CAS Document.

2. Developing and using models

3. Planning and carrying out investigations

4. Analyzing and interpreting data

5. Using mathematics and computational thinking

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 grade 5 standards is assessed according to the CCC progressions.

Not all CCCs are included in the Grade 5 standards. Those which are included in Grade 5 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.

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: simulations, clusters, and standalone items.

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

Clusters: Students are presented with background information, still images, graphs, tables, and additional media and asked 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.

Simulation and 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 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 2023) Science Assessment Framework* Grade 5	% of Total Test Score Points	Points		
			Cluster (7-9 Points each)	Mini Cluster (5-6 points each)	Standalone (1-2 Points Each)
1	**Physical Science**	**35**	**7-9**	**0-6**	**3-9**
	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: 5.1.1 Matter exists as particles that are too small to be seen; measurements of a variety of observable properties can be used to identify particular materials. **Evidence Outcomes:** a. Develop a model to describe that matter is made of particles too small to be seen. (5-PS1-1) b. Make observations and measurements to identify materials based on their properties. (5-PS1-3) **Grade Level Expectation: 5.1.2 Chemical Reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.** **Evidence Outcomes:** a. 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. (5-PS1-2) b. Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (5-PS1-4) **Grade Level Expectation: 5.1.3 The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.** **Evidence Outcomes:** a. Support an argument that the gravitational force exerted by Earn objects is directed down. (5-PS2-1)				

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2	**Physical/Life Science****	**24**	**7-9**	**0-6**	**0-7**
	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.				
	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: 5.1.4 The energy released from food was once energy from the sun. **Evidence Outcomes:** a. Use models to describe that energy in animals' food (used for body repair, growth and motion and to maintain body warmth) was once energy from the sun. (5-PS3-1) **Grade level Expectation: 5.2.2 Matter cycles between air and soil and among plants, animals and microbes as these organisms live and die.** **Evidence Outcomes:** a. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (5-LS2-1)				
	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: 5.2.1 Plants acquire their material from growth chiefly from air and water. **Evidence Outcomes:** a. Support an argument that plants get the materials they need for growth chiefly from air and water. (5-LS1-1)				

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3	**Earth and Space Science**	**41**	**7-9**	**0-6**	**4-12**
	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: 5.3.1 Stars range greatly in size and distance from Earth, and this can explain their relative brightness. **Evidence Outcomes:** a. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. (5-ESS1-1) **Grade Level Expectation: 5.3.2 Earth's orbit and rotation and the orbit of the moon around earth cause observable patterns.** **Evidence Outcomes:** a. 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. (5-ESS1-2)				
	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.				
	Grade Level Expectation: 5.3.3 Earth's major systems interact in multiple ways to affect Earth's surface materials and processes. **Evidence Outcomes:** a. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere and/or atmosphere interact. (5-ESS2-1) (Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.) (Boundary Statement: Limited to the interactions of two systems at a time.)				

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	Grade Level Expectation: 5.3.4 Most of Earth's water is in the ocean and much of Earth's freshwater in glaciers or underground. **Evidence Outcomes:** a. Describe and graph the amounts and percentages of saltwater and freshwater in various reservoirs to provide evidence about the distribution of water on Earth. (5-ESS2-2) **Grade Level Expectation: 5.3.5 Societal activities have had major effects on land, ocean, atmosphere and even outer space.** **Evidence Outcomes:** a. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. (5-ESS3-1)				
4	**Science and Engineering Practices (SEP) – Represented in Grade 5 Standards**	**65-75**			
All Standards	**Item Types**				
	Selected Response and Technology Enhanced Items	**53**			
	Constructed Response Items	**47**			
Total		**100**	**24-26**	**10-12**	**15-17**

**The Physical/Life Science Category Encompasses Physical Science EO 5.1.4.a as it is inextricably connected to the two Life Science EOs at this grade level.

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