

# Colorado Measures of Academic Success



# High School Science

## Answer Key with Scoring Rubrics

Practice Resource for Students

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## ITEM INFORMATION

### Colorado Academic Standard (CAS) Evidence Outcome

Describes the evidence that demonstrates that a student is meeting the grade level expectation at a mastery level.

### 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.

### Science and Engineering Practices

The Science and Engineering Practices (SEPs) in the CAS are interwoven within certain items, and all SEPs are assessed according to the [SEP progressions](#). The SEP is the first few words of the Evidence Outcome. If an SEP is not present in an item, then the item will not ask the student to demonstrate knowledge of the first part of the Evidence Outcome.

### 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 CAS is assessed according to the [CCC progressions](#).

### 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 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 observed phenomenon. They answer multiple two- or three-dimensional questions related to the content 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 described phenomenon. Using their knowledge of the 2020 CAS, they answer multiple two- or three-dimensional questions related to the content.

#### *Standalone Items*

Students are presented with a unique phenomenon and asked to make sense of that phenomenon based on the information in the stimulus. They 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 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. These Evidence Outcomes rotate on an annual basis.

## ITEM TYPES

Items are questions that appear on the assessments. They 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 select a correct answer out of provided choices. For fill in the blank items, students type/write their answer in a blank box.

### Technology-Enhanced (Bar Graph, Drag and Drop, Inline Choice, Hot Spot, and Match Table Grid):

Students show their answer using technology, such as by creating a bar graph using a template provided by the online testing system or on the paper-based test. Drag and drop items require students to drag answer choices into correct answer bays (draw lines or write corresponding letters for paper-based testing). Inline choice items require students to select their answer from a drop-down menu (circle answer from a list of choices for paper-based testing) to complete a sentence or sentences. Hot spot items require students to select the correct response from its location in an image (write corresponding letters or circle answer for paper-based testing). Match table grid items require students to check checkboxes in cells to indicate a match between the column and row labels.

### Constructed Response:

Students construct an open-ended response.

## STUDENT PERFORMANCE

### P Value – Selected Response Only

The P value represents the percentage of students who answered each selected response question correctly. For example, if the P value associated with a question is 0.64, then 64% of students responded to the question with the correct answer.

### Score Point Distribution – Constructed Response Only

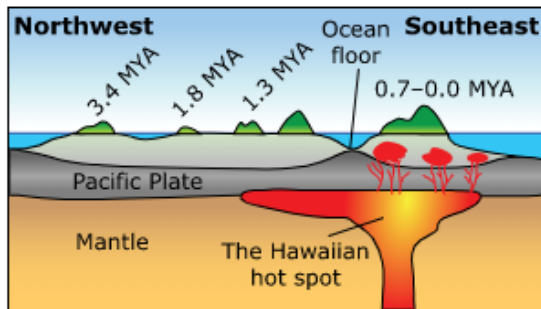
The score point distribution provides the percentage of students who scored at each possible score point for constructed response questions.

In addition to score point distribution, the scoring guide, scoring rubric, and sample student responses at each score point are provided for constructed response items.

**ANSWER KEY: ITEM SET 1**

*Item Set 1 - Question 1 (Selected Response)*

The diagram shows the Hawaiian hot spot and the ages at which some Hawaiian islands were formed millions of years ago (MYA). The oldest island shown is Oahu, which formed 3.4 MYA, while the youngest is Hawaii, which formed between 0.7 and 0.0 MYA.



not to scale

Based on the information in the diagram, which statement explains how the islands that are **not** directly over the Hawaiian hot spot formed?

- A. The Hawaiian hot spot moved to the northwest, causing lava to move along the ocean floor.
- B. The Hawaiian hot spot moved to the southeast, causing lava to move along the ocean floor.
- C. The Pacific Plate moved to the northwest, over the Hawaiian hot spot.
- D. The Pacific Plate moved to the southeast, over the Hawaiian hot spot.

Item Information		
Answer:	C	
Grade Level Expectation:	SC.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 Outcome:	SC.HS.3.3.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.
Standard:	Earth and Space Science	

Item Set 1 – Question 2 (Multiple Select)

A student drops objects of different masses to measure force. The student uses objects with these masses: 1 kilogram (kg), 10 kg, and 20 kg. The student drops each object from a height of 10 meters. All the objects take the same amount of time to fall. The resulting data are shown in the table.

Mass and Force Data

Object	Mass (kg)	Force (newtons)
W	1	9.8
X	10	98
Y	20	186

The student claims that the data support Newton's Second Law of Motion.

**Newton's Second Law of Motion**

The force acting on an object causes it to accelerate according to this formula

$$F = m \cdot a$$

where

$F$  = force, in newtons (N)

$m$  = mass, in kilograms (kg)

$a$  = acceleration, in meters per second squared ( $m/s^2$ )

Select the **two** pieces of evidence from the investigation that support the student's claim.

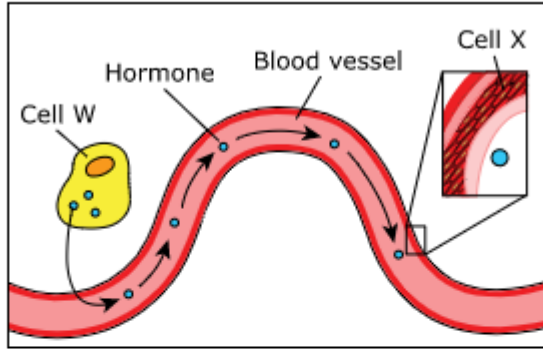
- A. Each object exerts the same force on Earth as Earth exerts on the object.
- B. Each object starts to move only after a force is applied to it.
- C. The forces are all in proportion to the masses they affect.
- D. The objects are all dropped from the same height.
- E. The objects all accelerate at the same rate.

**Item Information**

Answer:	C, E	
Grade Level Expectation:	SC.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 Outcome:	SC.HS.1.4.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.
Standard:	Physical Science	

Item Set 1 – Question 3 (TEI Inline Choice)

Study the model of hormone interactions.



Select one correct response from each drop-down menu to complete the sentences.

This model shows steps 1 and 2 of the process described in Part 1. In the model, the hormone is released by Cell W, which is part of the  system. The hormone leaves the circulatory system and binds to Cell X in  that .

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.2.1	DNA codes for the complex hierarchical organization of systems that enable life's functions.
Evidence Outcome:	SC.HS.2.1.b	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
Standard:	Life Science	

Item Set 1 – Question 4 (TEI Drag and Drop)

**Model of Some Actions of the Endocrine System**

```

    graph LR
      A[Endocrine system] -- A --> B[B]
      B -- C --> D[D]
      B -- "Decreases blood flow" --> E[E]
  
```

One body system and one action are labeled in the model. Use the information and steps in Part 1 to develop the model.

Drag each letter from the model into the table to label the step or body system. Each letter may be used once.

Letter	Step or Body System
A	Step 1
C	Step 3
E	nervous system
D	digestive system
B	circulatory system

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.2.1	DNA codes for the complex hierarchical organization of systems that enable life's functions.
Evidence Outcome:	SC.HS.2.1.b	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
Standard:	Life Science	



Item Set 1 – Question 5 (Selected Response)

A student wants to add a fifth step to the digestion process described in Part 1 to help explain one reason why people might feel tired after eating.

Based on the information provided, which statement should be Step 5 of the digestion process?

- A. More blood flows to the endocrine system.
- B. Less blood flows to the endocrine system.
- C. More blood flows to the nervous system.
- D. Less blood flows to the nervous system.

Item Information		
Answer:	D	
Grade Level Expectation:	SC.HS.2.1	DNA codes for the complex hierarchical organization of systems that enable life's functions.
Evidence Outcome:	SC.HS.2.1.b	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
Standard:	Life Science	

Item Set 1 – Question 6 (TEI Inline Choice)

The students want to compare the data measured for each subject in the digestion investigation described in Part 2.

Select one correct response from each drop-down menu to complete the sentences.

The students can better compare data if the ratio of the

to the  is

consistent for all the participants. This will help ensure that the data collected provides accurate evidence about how a subject's body systems work

to  homeostasis.

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.2.1	DNA codes for the complex hierarchical organization of systems that enable life's functions.
Evidence Outcome:	SC.HS.2.1.c	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
Standard:	Life Science	

Item Set 1 – Question 7 (Constructed Response)

A group of students discusses ideas for the frequency of data collection in the investigation described in Part 2. They come up with three possible plans.

- Plan A: Collect data 1 hour before, 10 minutes before, immediately before, and immediately after eating.
- Plan B: Collect data immediately before eating and immediately after eating.
- Plan C: Collect data immediately before, immediately after, 10 minutes after, and 1 hour after eating.

Determine which plan will give the students the most usable data. Your response should include:

- the plan that will provide the best evidence for the effect of feedback loops on homeostasis
- why this plan will provide the best evidence for the effect of feedback loops on homeostasis

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.HS.2.1	DNA codes for the complex hierarchical organization of systems that enable life's functions.
Evidence Outcome:	SC.HS.2.1.c	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
Standard:	Life Science	

Sample Student Responses	
<i>Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.</i>	
Points	Sample Response
2	<p><b>Sample Response</b></p> <p>Plan C will provide the best evidence for the effect of feedback loops on homeostasis.</p> <p>Plan C will provide more data than Plan B and will provide more useful data than Plan A; collecting data one hour after eating is more valuable for evaluating changes in body systems resulting from the digestion process and how those changes are regulated by interactions among body systems to restore balance.</p>
	<p><b>Sample Annotation</b></p> <p>This response demonstrates a complete understanding of the task. The student clearly states which plan will provide the best evidence (<i>Plan C will provide the best evidence</i>) and explains why Plan C is the best choice for providing evidence for the effect of the feedback loop on homeostasis (<i>Plan C will provide more data than Plan B and will provide more useful data than Plan A; collecting data one hour after eating is more valuable</i>).</p>
1	<p><b>Sample Response</b></p> <p>The plan that tests before eating, immediately after, ten minutes after, and 1 hour after eating will provide the best evidence for the effect of feedback loops on homeostasis.</p>
	<p><b>Sample Annotation</b></p> <p>This response demonstrates a partial understanding of the task. The student indicates which plan will provide the best evidence (<i>The plan that tests before eating, immediately after, ten minutes after, and 1 hour after eating</i>). Even though the student does not directly state a plan by letter, it is</p>

	clear this is the data collection schedule that corresponds to Plan C. No explanation is given as to why this plan would provide the best evidence for the effect of feedback loops on homeostasis.
0	<b>Sample Response</b>
	The plan that collects data immediately before and immediately after the meal will be the best.
	<b>Sample Annotation</b>
	This response does not demonstrate an understanding of the task. The incorrect plan is indicated, and no explanation is provided.

*Item Set 1 – Question 8 (TEI Inline Choice)*

Compare the trials with the lid on the container to the trials with the lid off the container.

Select one correct response from each drop-down menu to complete the sentence.

For the low-heat trials, the difference between the

data in the two trials represents

the energy  the system by escaping steam.

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.1.7	Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
Evidence Outcome:	SC.HS.1.7.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.
Standard:	Physical Science	

Item Set 1 – Question 9 (Selected Response)

The student wants to find out how much heat is lost to the environment in this trial from the simulation:

Power (watts)	Lid
Low: 950	On

Using the data from this trial, which calculation can be used to determine how much heat is lost to the environment?

- A. Subtract the energy used in this trial from the energy needed to heat the water to the boiling point.
- B. Subtract the low power of the hot plate from the maximum power capacity of the hot plate.
- C. Subtract the time for this trial from the time for the trial at the low setting with the lid off.
- D. Subtract the initial temperature from the ending temperature for this trial.

Item Information		
Answer:	A	
Grade Level Expectation:	SC.HS.1.7	Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
Evidence Outcome:	SC.HS.1.7.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.
Standard:	Physical Science	

Item Set 1 – Question 10 (TEI Inline Choice)

A method of energy transfer is considered to be more efficient when it uses less energy to perform the same task as other methods. The student modifies the investigation by using a lid made of a less conductive material than the metal lid used in the investigation to determine whether this will affect the efficiency of energy transfer.

Select one correct response from each drop-down menu to complete the sentence.

Using a lid made of a less conductive material than the metal lid used in the investigation will result in

heat lost to the surrounding environment and will  the efficiency of energy transfer.

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.1.9	Although energy cannot be destroyed, it can be converted to less useful forms as it is captured, stored and transferred.
Evidence Outcome:	SC.HS.1.9.a	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy
Standard:	Physical Science	

Item Set 1 - Question 11 (Constructed Response)

Describe the energy transfer for the investigation in the simulation, and explain a limitation for converting all the available energy into usable energy. Your response should include:

- a description of the energy transfer, including an identification of the starting form of energy and the resulting form of energy
- an explanation of a limitation for converting all the available energy into usable energy

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.HS.1.9	Although energy cannot be destroyed, it can be converted to less useful forms as it is captured, stored and transferred.
Evidence Outcome:	SC.HS.1.9.a	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy
Standard:	Physical Science	

Sample Student Responses	
<i>Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.</i>	
Points	Sample Response
2	<p>The electrical energy of the hot plate is the starting form of energy. This electrical energy is converted into thermal energy. Some of this thermal energy is absorbed by the pot-lid-water system and the rest is released into the environment.</p> <p>The trial cannot be 100% efficient because some of the thermal energy produced will be released into the surrounding environment and cannot be used to heat the water.</p>
	<p><b>Sample Annotation</b></p> <p>This response demonstrates a complete understanding of the task. A description energy transfer including the starting form and the resulting form of the energy is provided (<i>electrical energy is converted into thermal energy</i>). An explanation of the limitation for converting all the available energy into usable energy is provided (<i>some of the thermal energy produced will be released into the surrounding environment and cannot be used to heat the water</i>).</p>
1	<p><b>Sample Response</b></p> <p>The energy chain starts out with electricity to power the hotplate. The hotplate uses the electricity to make heat to warm the pot and then the water in the pot. So the energy starts as electrical energy and is turned into thermal energy.</p> <p>There is a limitation for converting the energy when the switch is set to low. This limits the amount of electrical energy going to heat the water.</p>
	<p><b>Sample Annotation</b></p> <p>This response demonstrates a partial understanding of the task. The response correctly describes the energy transfer, including the starting and resulting forms of energy (<i>the energy starts as electrical energy and is turned into thermal energy</i>). However, the response does not give a valid explanation of the limitation for converting all the available energy into usable energy because the amount of heat applied by the selection of low heat does not impact the efficient transfer of energy from one form or item to another.</p>

<b>0</b>	<b>Sample Response</b>
	The hotplate warms the water, making it boil. The water is limited to 100°, because if it gets any hotter, it turns to steam and evaporates.
	<b>Sample Annotation</b>
	This response does not demonstrate an understanding of the task. The description of the energy transfer is incomplete because it does not identify the starting form of electrical energy and the transfer of thermal energy is only minimally addressed. The explanation of a limitation for converting all the usable energy is incorrect because the maximum temperature of the water has no bearing on the efficient transfer of energy.

*Item Set 1 - Question 12 (Constructed Response)*

In the investigation in the simulation, each trial was performed with a mass of 2.8 kilograms (kg) of water. The student researched data for energy transfer and found that 261.3 Watt-hours (Wh) is the expected amount of energy required to heat 2.8 kg of water from 20°C to the boiling point.

Use the data table from the investigation to determine which of the four trials lost the most energy to the surrounding environment. Your response should include:

- identification of the trial that lost the most energy to the surrounding environment
- the full calculation of the approximate energy that was lost to the surrounding environment in this trial

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.HS.1.7	Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
Evidence Outcome:	SC.HS.1.7.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.
Standard:	Physical Science	

Sample Student Responses	
<i>Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.</i>	
<b>2</b>	<p><b>Sample Response</b></p> <p>The trial that lost the most energy to the surrounding environment was the trial with low power (950 W) with the lid off.</p> <p>The amount of energy lost in this trial was approximately 121 Wh, calculated by subtracting the theoretical amount of energy to heat the water from the total amount of energy used in this trial: 382.6 Wh – 261.3 Wh = 121.3 Wh.</p> <p><b>Sample Annotation</b></p>

	This response demonstrates a complete understanding of the task. The correct trial is identified [ <i>the trial with low power (950 W) with the lid off</i> ], and the approximate amount of lost energy is calculated ( <i>subtracting the theoretical amount of energy to heat the water from the total amount of energy used in this trial: <math>382.6 \text{ Wh} - 261.3 \text{ Wh} = 121.3 \text{ Wh}</math></i> ).
1	<b>Sample Response</b> The trial with low heat and the lid off lost the most energy to the environment. I know this because the table shows that that combination used the most energy.
	<b>Sample Annotation</b> This response demonstrates a partial understanding of the task. The correct trial is identified ( <i>The trial with low heat and the lid off lost the most energy</i> ), but the approximate amount of lost energy is not calculated.
0	<b>Sample Response</b> The trial with low heat and the lid on lost the most energy. I know this because the energy used, 322.9, is closest to the energy calculated, 261.3.
	<b>Sample Annotation</b> This response does not demonstrate an understanding of the task. An incorrect trial is identified ( <i>low heat and the lid on</i> ). The approximate amount of lost energy is not calculated, numbers from the prompt are just compared.



Item Set 1 - Question 13 (Constructed Response)

Each trial in the simulation started with 2.8 liters of water at 20°C. The student modifies the investigation to mix two samples of water at different temperatures, as shown in the table.

Water Sample	Volume	Initial Temperature
A	1.4 liters	20°C
B	1.4 liters	80°C

Predict how the time required to heat the water to the boiling point in a container with the lid off at low power will be different if Sample A and Sample B are mixed to make the initial 2.8 liters of water.

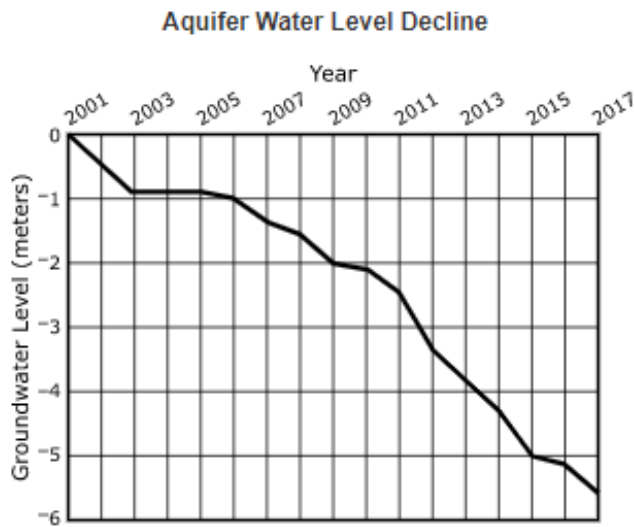
Your response should include:

- a description of how to calculate the expected final temperature, in degrees Celsius (°C), when Sample A and Sample B are mixed
- an explanation of the expected time, in seconds, for the combined samples to heat to the boiling point in a container with the lid off at low power

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.HS.1.7	Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
Evidence Outcome:	SC.HS.1.7.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).
Standard:	Physical Science	

Item Set 1 - Question 14 (Multiple Select)

An agricultural community uses an aquifer, described in Part 1, as a water source for farming and for residential use. The community monitors the water level of the aquifer. The graph shows the changes in the water level from January 2001 through January 2017.



Which actions would most effectively conserve the aquifer water level?  
Select **two** correct statements.

- A. The local government enacts water conservation policies for residents.
- B. Farmers replace the layer of topsoil to make it more permeable.
- C. The community adds porous rock above the aquifer.
- D. Farmers grow crops that require less irrigation.
- E. The community relocates to another area.

Item Information		
Answer:	A, D	
Grade Level Expectation:	SC.HS.3.9	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
Evidence Outcome:	SC.HS.3.9.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.
Standard:	Earth and Space Science	

Item Set 1 - Question 15 (Selected Response)

Based on Figure 1, which statement most correctly explains why people need to drill below the water table in an aquifer?

- A. Water below the water table in aquifers increases the water supply when there is not enough water from nearby lakes and springs.
- B. Water below the water table in aquifers flows through an aquifer more rapidly than surface water flows into a lake.
- C. Water below the water table in aquifers is more easily accessible than water from nearby lakes and springs.
- D. Water below the water table in aquifers is under less pressure than water from nearby lakes and springs.

Item Information		
Answer:	A	
Grade Level Expectation:	SC.HS.3.9	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
Evidence Outcome:	SC.HS.3.9.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.
Standard:	Earth and Space Science	

Item Set 1 – Question 16 (TEI Inline Choice)

A student decides to further investigate the types of wells described in Part 2. The student wants to test rock types to determine their effectiveness as aquifers. The student uses these materials:

- samples of four different rock types
- water
- graduated cylinder
- timer
- scale

The student submerges each of the four rock samples individually in 500 milliliters (mL) of water.

Select one correct response from each drop-down menu to complete the sentence.

To determine which of the rock types in the investigation would be the most efficient aquifer, the student should remove each sample from the water and measure the  to find the .

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.3.6	The planet's dynamics are greatly influenced by water's unique chemical and physical properties.
Evidence Outcome:	SC.HS.3.6.a	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes
Standard:	Earth and Space Science	

Item Set 1 - Question 17 (TEI Inline Choice)

One of the most important needs for early settlers was a source of water.

Using the information in Part 2, select one correct response from each drop-down menu to complete the sentences.

People were more likely to settle in areas where the artesian pressure surface of a  was  ground level.

This allowed people to use local groundwater resources without creating technology to .

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.HS.3.9	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
Evidence Outcome:	SC.HS.3.9.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.
Standard:	Earth and Space Science	

Item Set 1 - Question 18 (Constructed Response)

The diagram shows a proposed drill site for a well.

Use the information in Part 2 to evaluate the costs and benefits of a well with Depth A and a well with Depth B. Your response should include:

- a cost comparison between the wells at Depth A and Depth B
- a performance comparison between the wells at Depth A and Depth B

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.HS.3.9	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
Evidence Outcome:	SC.HS.3.9.b	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
Standard:	Earth and Space Science	

Sample Student Responses	
<i>Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.</i>	
<b>Points</b>	
<b>2</b>	<p><b>Sample Response</b></p> <p>It will cost more to drill to Depth B than Depth A. A well at Depth B will need less pumping than one at Depth A, and there would be less salt water mixed in with the fresh water at Depth B.</p>
	<p><b>Sample Annotation</b></p> <p>The student demonstrates a complete understanding of the task. A correct cost comparison is made between the wells at depth A and depth B (<i>It will cost more to drill to Depth B</i>). A correct performance comparison is provided (<i>A well at Depth B will need less pumping ... there would be less salt water mixed in with the fresh water</i>), addressing both the salinity of the water and the necessity of a pump for both depths.</p>
<b>1</b>	<p><b>Sample Response</b></p> <p>The well at depth B would be more expensive than depth A. Since B is deeper, it will be harder to pump the water out.</p>
	<p><b>Sample Annotation</b></p> <p>This response demonstrates a partial understanding of the task. The cost comparison on the two depths is correct (<i>depth B would be more expensive than depth A</i>). The performance comparison is incorrect (<i>B ... will be harder to pump the water out</i>) and incomplete because it lacks a comparison of the salinity of the water at each depth.</p>

0	<b>Sample Response</b>
	Drilling a well to depth A will probably cost more to drill than depth B. The wells both have water, but the water from B is probably better, since it comes from farther down.
	<b>Sample Annotation</b>
	This response does not demonstrate an understanding of the task. The comparison of costs for the two depths is incorrect ( <i>depth A will probably cost more</i> ). The performance comparison is incomplete because there is no mention of the relative salinity or necessity of a pump for the two depths.

Item Set 1 - Question 19 (Constructed Response)

A student investigates why so many parental characteristics are expressed in their offspring. The student makes a model to represent the structures involved in the passing of traits from parent to offspring.

Identify the structures using the student's model and explain how proteins that result in different traits can be formed from the same structure. Your answer should include:

- the identification of Structure 1 and Structure 2
- an explanation of how different traits arise from proteins formed from these structures

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.HS.2.8	The characteristics of one generation are dependent upon the genetic information inherited from previous generations.
Evidence Outcome:	SC.HS.2.8.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.
Standard:	Life Science	

**Sample Student Responses**

*Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*

Points	
2	<b>Sample Response</b>
	Structure 1 is a chromosome, and Structure 2 is the DNA found on the chromosome. Protein A and Protein B are each formed from instructions carried on different genes in the DNA that is inherited from the parents. Each protein has distinct properties and either play different roles or determine different traits in an individual.
	<b>Sample Annotation</b>
	The response demonstrates a complete understanding of the task. The two structures shown in the diagram are identified ( <i>Structure 1 is a chromosome, and Structure 2 is the DNA found on the chromosome</i> ) and a complete explanation of how different traits arise from proteins formed by these structures is provided ( <i>Protein A and Protein B are each formed from instructions carried on different genes in the DNA that is inherited from the parents. Each protein has distinct properties</i> ).
1	<b>Sample Response</b>
	Parents pass their traits to their children on their DNA. The DNA says what protein it will make.
	<b>Sample Annotation</b>
	This response demonstrates a partial understanding of the task. An explanation of the relationship between DNA and proteins and how traits are passed from parent to offspring ( <i>Parent pass their traits ... on their DNA. The DNA says what protein it will make</i> ) is provided. Neither structure is identified.
0	<b>Sample Response</b>
	DNA can make your eyes blue or it can make your eyes brown.
	<b>Sample Annotation</b>
	This response does not demonstrate an understanding of the task. The explanation provided is too vague to demonstrate any understanding of the task.