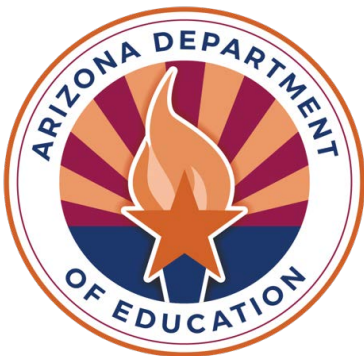




ARIZONA SCIENCE TEST

Computer-Based
Sample Test
Scoring Guide
Grade HS Science



*Created August 2022
Prepared by the Arizona Department of Education*

About the Sample Test Scoring Guide

The Arizona Science Test (AzSCI) Sample Test Scoring Guides provide details about the items, student response types, correct responses, and related scoring considerations for AzSCI Sample Test items.

Within this guide, each item is presented with the following information:

- Item number
- Title
- Domain (Reporting Category)
- Science and Engineering Practices (SEP) Group
- Content Standard
- SEP
- Crosscutting Concept (CC)
- Phenomenon
- TAGS
- Item Type
- Number of score points
- Static presentation of the item
- Static presentation of student response field (when appropriate)
- Answer key or scoring rubric

The items included in this guide are representative of the kinds of items that students can expect to experience when taking the computer-based test for AzSCI Grade HS Science.

Grade HS Science Sample Test

Item Number	1
Item Title	Predictable Universal Patterns
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.E2U1.15
SEP	Construct explanations and design solutions
Crosscutting Concepts (CC)	Energy and Matter
Phenomenon	Observable and predictable patterns occur in space.
TAGS	G2
Item Type	Multiple Choice

Which statement describes the direct results of the events shown in **Figure 1**?

- A. Nuclear fusion results in star formation.
- B. Nuclear fusion results in planet formation.
- C. Nuclear fusion results in the emission of light.
- D. Nuclear fusion results in the absorption of heat.

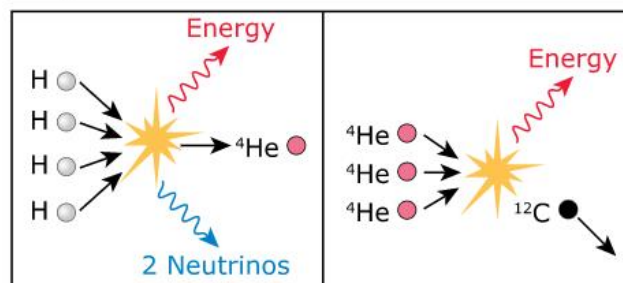
(1 Point)

Grade HS Science Sample Test

Item Number	2
Item Title	Predictable Universal Patterns
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Sensemaking
Content Standard	HS.E2U1.15
SEP	Construct explanations and design solutions
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	Observable and predictable patterns occur in space.
TAGS	G3
Item Type	Multiple Response


Figure 4: Fusion Processes in the Sun shows the specific nuclear fusion reactions that occur in stars such as our sun at different stages in their life cycle. The reaction on the left is called proton-proton fusion. This process produces helium-4 and energy during Stage 3 of the star life cycle. The reaction on the right is called triple alpha fusion. This process produces carbon-12 and energy during Stage 4 of the star life cycle.

Figure 4: Fusion Processes in the Sun



Proton-Proton Fusion

Triple Alpha Fusion

KEY	
H	○ = Hydrogen nucleus
⁴ He	● = Helium-4
¹² C	● = Carbon-12
	= Reaction

Using **Figure 1** and **Figure 4**, predict the most likely outcomes that will result when our sun reaches the end of the proton-proton fusion process.

(Continued on the next page)

(Continued)

Select **three** correct answers.

- A. The production of light by the sun will cease.
- B. The chemical composition of the sun's core will begin to change.
- C. The sun will begin to transform into a planetary nebula.
- D. The sun will continue to produce heavier elements.
- E. The circumference of the sun will change.
- F. The sun will have more total energy to continue fusion processes.

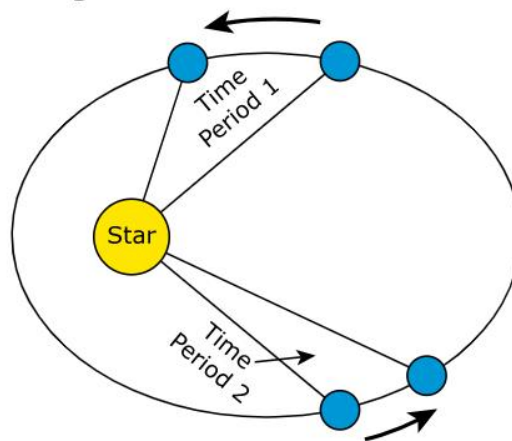
(1 Point)

Grade HS Science Sample Test

Item Number	3
Item Title	Predictable Universal Patterns
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Sensemaking
Content Standard	HS.E2U1.16
SEP	Construct explanations and design solutions
Crosscutting Concepts (CC)	Scale, Proportion, and Quantity
Phenomenon	Observable and predictable patterns occur in space.
TAGS	G3
Item Type	Inline Choice

Figure 5: Two Orbital Positions shows a planet orbiting a star during two different 50-day periods. Explain why the sections for the two time periods have the same area.

Figure 5: Two Orbital Positions



Complete the sentences by selecting the correct answers from the drop-down menus.

During Time Period 1, the planet moves it does during Time Period 2. This occurs because gravity from is during Time Period 1 than it is during Time Period 2.

(Continued on the next page)

(Continued)

Scoring Rubric	
Score	Description
1	During Time Period 1, the planet moves faster than it does during Time Period 2. This occurs because gravity from the star is stronger during Time Period 1 than it is during Time Period 2.
0	The response is incorrect or irrelevant.

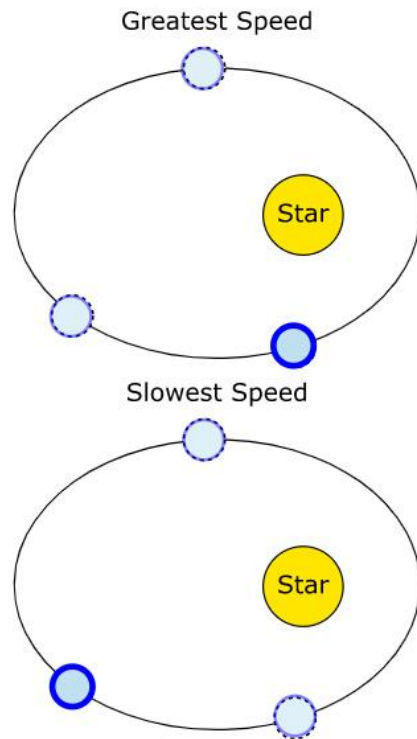
(1 Point)

Grade HS Science Sample Test

Item Number	4
Item Title	Predictable Universal Patterns
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.E2U1.16
SEP	Develop and use models
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	Observable and predictable patterns occur in space.
TAGS	G3
Item Type	Hot Spot

Each diagram shows a star with a planet orbiting it. Of the positions shown, identify **one** location where the planet is moving with the greatest speed and **one** location where the planet is moving with the slowest speed.

Select the correct planet position for each diagram.



(Continued on the next page)

(Continued)

Scoring Rubric	
Score	Description
1	Greatest speed: position closest to and below the star. Slowest speed: position farthest from star on the left.
0	The response is incorrect or irrelevant.

(1 Point)

Grade HS Science Sample Test

Item Number	5
Item Title	Predictable Universal Patterns
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.E2U1.17
SEP	Engage in argument from evidence
Crosscutting Concepts (CC)	Scale, Proportion, and Quantity
Phenomenon	Observable and predictable patterns occur in space.
TAGS	G3
Item Type	TPD—Multiple Choice and Multiple Choice

Note: This question has two parts –Part A

This question has **two** parts. First answer Part A. Then answer Part B.

Part A

Based on the data shown in **Figure 3**, which statement is correct?

- A. The farther a galaxy is from the Milky Way, the lower the recessional velocity of the galaxy.
- B. The farther a galaxy is from the Milky Way, the greater the recessional velocity of the galaxy.
- C. The distance that a galaxy is from the Milky Way does not affect the recessional velocity of the galaxy.
- D. The closer a galaxy is to the Milky Way, the greater the recessional velocity of the galaxy.

(Continued on the next page)

Note: This question has two parts(cont.)–Part B

Part B

Which of these is evidence that supports the answer to Part A?

- A. Figure 3 does not account for multiple galaxies.
- B. Figure 3 shows a relationship between recessional velocity and distance.
- C. Figure 3 shows that galaxies closer to each other have a greater recessional velocity.
- D. Figure 3 shows that galaxies farther from each other have a greater recessional velocity.

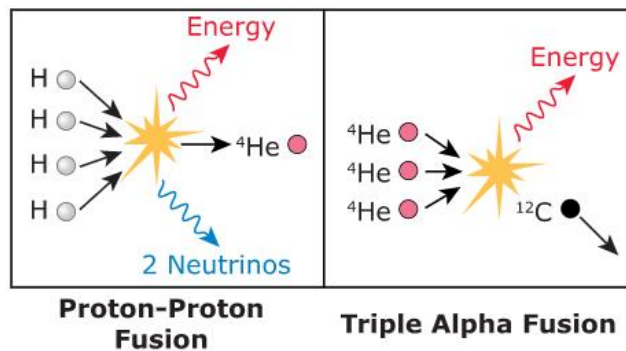
(1 Point) Student selected the correct answer for each part.

Grade HS Science Sample Test

Item Number	6
Item Title	Predictable Universal Patterns
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Sensemaking
Content Standard	HS.E2U1.15
SEP	Construct explanations and design solutions
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	Observable and predictable patterns occur in space.
TAGS	G3
Item Type	Gap Match Table

Figure 4: Fusion Processes in an Average-Size Star shows the specific nuclear fusion reactions that occur in stars such as our sun, an average size star, at different stages in their life cycle. The reaction on the left is called proton-proton fusion. This process produces helium-4 and energy during Stage 3 of the star life cycle. The reaction on the right is called triple alpha fusion. This process produces carbon-12 and energy during Stage 4 of the star life cycle.

Figure 4: Fusion Processes in an Average-Size Star



KEY	
H ○	= Hydrogen nucleus
⁴ He ●	= Helium-4
¹² C ●	= Carbon-12
	= Reaction

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(Continued)

Using **Figure 1** and **Figure 4**, predict the **most likely** events that will result when our sun reaches the end of the proton-proton fusion process.

Move the correct answers into the boxes. Not all answers will be used.

Most Likely Events

The chemical composition of the sun's core will begin to change.

The circumference of the sun will change.

The sun will continue to produce heavier elements.

Scoring Rubric	
Score	Description
1	The student selects the following Events: <ul style="list-style-type: none"> • The chemical composition of the sun's core will begin to change. • The circumference of the sun will change. The sun will continue to produce heavier elements.
0	The response is incorrect or irrelevant.

(1 Point)

Grade HS Science Sample Test

Item Number	7
Item Title	Cholera
Domain (Reporting Category)	Earth and Space Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.E1U3.14
SEP	Obtain, evaluate, and communicate information
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	The bacterium that causes cholera is naturally present in the environment and is a threat to public health. Changes in climate may produce environmental conditions that trigger cholera disease outbreaks. Some scientists have developed a method that uses satellite data to anticipate cholera outbreaks.
TAGS	S3
Item Type	Match Table Grid

A scientist claims that the risk of cholera outbreaks increases when large, unregulated populations are established near natural water supplies such as lakes and aquifers.

Indicate whether each statement supports the claim or does not support the claim.

Select **all** the correct answers.

Statement	Supports Claim	Does Not Support Claim
A water supply experiences an overall decrease in temperature during the winter season.	<input type="radio"/>	<input checked="" type="radio"/>
People will move away from areas where goods are scarce.	<input type="radio"/>	<input checked="" type="radio"/>
People with few choices will drink whatever water is available.	<input checked="" type="radio"/>	<input type="radio"/>
A water supply can contain farm waste from agricultural areas.	<input checked="" type="radio"/>	<input type="radio"/>

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(Continued)

Scoring Rubric	
Score	Description
1	Only statements 3 and 4 support the claim.
0	The response is incorrect or irrelevant.

(1 Point)

Grade HS Science Sample Test

Item Number	8
Item Title	Cholera
Domain (Reporting Category)	Life Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.L2U3.18
SEP	Construct explanations and design solutions
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	The bacterium that causes cholera is naturally present in the environment and is a threat to public health. Changes in climate may produce environmental conditions that trigger cholera disease outbreaks. Some scientists have developed a method that uses satellite data to anticipate cholera outbreaks.
TAGS	G3
Item Type	Multiple Choice

Some human activities can lead to changes in water sources that allow for the rapid reproduction of algae and the copepods that carry *V. cholerae*. These activities can lead to the spread of cholera and can also result in the loss of healthy water environments in the ecosystem.

Which statement **best** describes why biodiversity in the ecosystem is likely affected?

- A. The algae and the copepods attract large predators that would not normally be found in the ecosystem.
- B. The *V. cholerae* on the copepods cause salinity to increase, affecting the other marine organisms in the ecosystem.
- C. The overproduction of algae increases the availability of sunlight, benefiting submerged organisms in the ecosystem.
- D. The algae and the copepods deplete resources, making the resources unavailable to other organisms in the ecosystem.

(1 Point)

Grade HS Science Sample Test

Item Number	9
Item Title	Cholera
Domain (Reporting Category)	Life Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Sensemaking
Content Standard	HS.L2U1.19
SEP	Develop and use models
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	The bacterium that causes cholera is naturally present in the environment and is a threat to public health. Changes in climate may produce environmental conditions that trigger cholera disease outbreaks. Some scientists have developed a method that uses satellite data to anticipate cholera outbreaks.
TAGS	G3
Item Type	TPI—Bar Graph and Multiple Choice

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Note: This question has two parts –Part A

This question has **two** parts. First answer Part A. Then answer Part B.

Part A

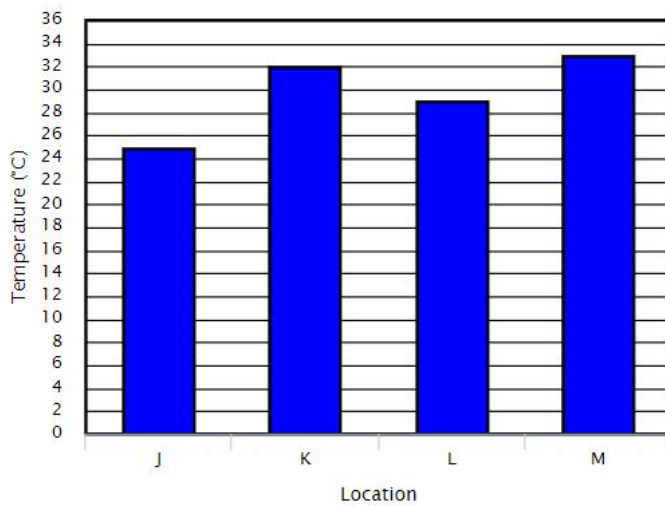
The table shows the water temperature of several lakes in locations known to harbor cholera bacteria.

Location	Normal Water Temperature (°C)
J	20
K	27
L	24
M	28

For each location, identify the lowest temperature at which there is **at least** a 2 to 4 times greater risk of cholera.

Drag the top of each bar to the correct height.

Water Temperatures That Increase Risk of Cholera Outbreak



(Continued on the next page)

Note: This question has two parts(cont.)–Part B

Part B

Which statement **best** explains how higher temperatures make a cholera outbreak more likely?

- A. Warmer waters provide the cholera bacteria with the energy needed for reproduction.
- B. Warmer waters decrease the survival of the predators that feed on the cholera bacteria.
- C. Warmer waters allow the organisms that carry the cholera bacteria to increase in number.
- D. Warmer waters prevent organisms that photosynthesize from competing with the cholera bacteria.

Scoring Rubric	
Score	Description
2	PART A: The bar values from left to right should be: 25, 32, 29, and 33 PART B: Option C
1	The student provides the correct response to Part A or Part B.
0	The response is incorrect or irrelevant.

(2 Points) Student selected the correct answer for each part.

Grade HS Science Sample Test

Item Number	10
Item Title	Insect Population Declines
Domain (Reporting Category)	Life Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Critiquing
Content Standard	HS.L2U3.18
SEP	Obtain, evaluate, and communicate information
Crosscutting Concepts (CC)	Cause and Effect
Phenomenon	The biodiversity of insects on nature preserves in western Europe has been steadily declining for over 20 years.
TAGS	G3
Item Type	Multiple Response

Aphids are small insects that eat many types of plants. Scientists have a theory that when pesticides are used, they reduce local populations of insects that prey on aphids. They also theorize that after long periods of exposure to pesticides, some species of predator insects can disappear completely. Based on these two theories, predict how the use of pesticides would affect the biodiversity in the nature reserve?

Select **two** correct answers.

- A. Aphids would have few predators and would outcompete other insects.
- B. Large aphid populations would attract new predators to the nature reserve.
- C. Aphids would use up the resources that are necessary for the survival of plants.
- D. Large aphid populations would increase the biomass of plants in the nature reserve.
- E. Large aphid populations would contribute to a reduction in the number of plant species.

(1 Point)

Grade HS Science Sample Test

Item Number	11
Item Title	Insect Population Declines
Domain (Reporting Category)	Life Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.L2U3.18
SEP	Analyze and interpret data
Crosscutting Concepts (CC)	Patterns
Phenomenon	The biodiversity of insects on nature preserves in western Europe has been steadily declining for over 20 years.
TAGS	G3
Item Type	TPD—Point Graph and Inline Choice

Note: This question has two parts –Part A

This question has **two** parts. First answer Part A. Then answer Part B.

Part A

The data in the table show the average monthly rate change of insect biomass during the months of April to October in the biodiversity study.

Average Rate Change of Insect Biomass During the Months of April to October

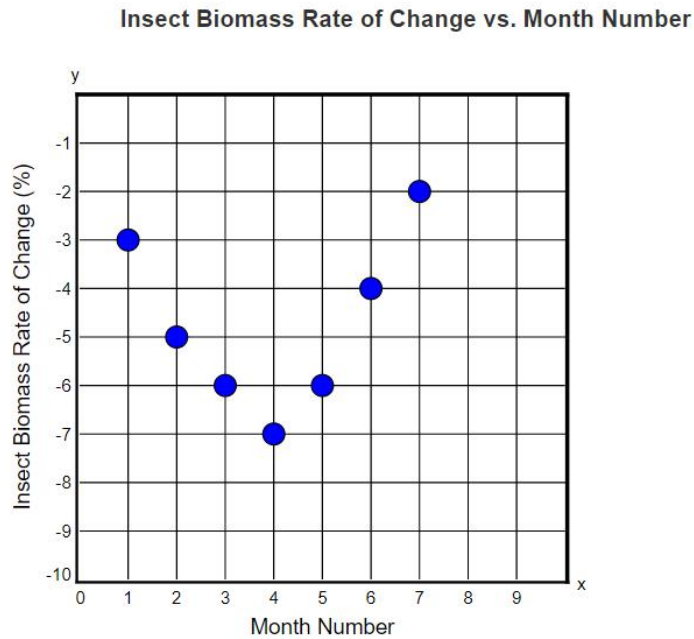
Month Number	Month	Insect Biomass Rate of Change (%)
1	April	-3
2	May	-5
3	June	-6
4	July	-7
5	August	-6
6	September	-4
7	October	-2

Use the data from the table to complete a graph showing the Insect Biomass Rate of Change vs. Month Number.

Select a location on the coordinate grid to plot each data point from the table.

(Continued on the next page)

Note: This question has two parts(cont.)–Part B



Part B

Use the information shown in **Figure 1**, **Figure 2**, and Part A to construct a statement that explains whether the creation of the nature reserve is serving its intended purpose.

Complete the sentences by selecting the correct answers from the drop-down menus.

During the 25-year study, insect biomass and plant diversity

, with the greatest insect biomass

happening during the months. These results indicate

that the nature reserve is the environment.

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(Continued)

Scoring Rubric	
Score	Description
1	<p>Part A: The students plot (1, -3), (2,-5), (3, -6), (4, -7), (5, -6), (6,-4), and (7, -2).</p> <p>Part B: During the 25-year study, insect biomass and plant diversity decreased, with the greatest loss of insect biomass happening during the summer months. These results indicate that the nature reserve is not protecting the environment.</p>
0	The response is incorrect or irrelevant.

(1 Point)

Grade HS Science Sample Test

Item Number	12
Item Title	Bottle Rocket Activity
Domain (Reporting Category)	Physical Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.P2U1.5
SEP	Develop and use models
Crosscutting Concepts (CC)	System and System Models
Phenomenon	A rocket is pushed up against Earth’s gravitational field before falling back down to Earth’s surface.
TAGS	S3
Item Type	Graphic Gap Match

Based on the data in **Table 1**, compare the rate of acceleration, net force, and effect of gravitational acceleration for Rocket A and Rocket B during launch.

Move the correct answer to each box. Each answer may be used more than once.

The diagram shows two bottle rockets, A and B, being launched. Rocket A has a smaller amount of water, while Rocket B has a larger amount. Each rocket has a corresponding set of three boxes for 'Rate of Acceleration', 'Net Force', and 'Gravitational Acceleration'.

Rate of Acceleration	Higher	Rate of Acceleration	Lower
Net Force	Higher	Net Force	Lower
Gravitational Acceleration	Identical	Gravitational Acceleration	Identical

(Continued on the next page)

(Continued)

Scoring Rubric	
Score	Description
1	Rocket A: Acceleration: High; Net Force: High; Gravitational Acceleration: Identical Rocket B: Acceleration: Low; Net Force: Low; Gravitational Acceleration: Identical
0	The response is incorrect or irrelevant.

(1 Point)

Grade HS Science Sample Test

Item Number	13
Item Title	Bottle Rocket Activity
Domain (Reporting Category)	Physical Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Investigating
Content Standard	HS.P3U1.6
SEP	Analyze and interpret data
Crosscutting Concepts (CC)	Patterns
Phenomenon	A rocket is pushed up against Earth’s gravitational field before falling back down to Earth’s surface.
TAGS	G3
Item Type	TPI—Multiple Choice and Inline Choice

Note: This question has two parts –Part A

This question has **two** parts. First answer Part A. Then answer Part B.

Part A

Based on the data in **Table 1**, which conclusion about Rocket A is **most likely** valid?

- A. The pressure inside the rocket was lower than the outside pressure and was therefore ideal for the achieved height.
- B. The initial ratio of water volume to air inside the rocket was ideal for it to reach the greatest height.
- C. The air in the rocket was retained until the rocket reached its greatest height.
- D. The amount of water in the rocket was ideal for keeping all forces balanced while it reached its greatest height.

(Continued on the next page)

Note: This question has two parts(cont.)–Part B

Part B

Explain why Rocket A goes higher than Rocket D before starting to come down.

Complete the sentence by selecting the correct answers from the drop-down menus.

Rocket A experiences a greater acting on it over a longer period of time due to a smaller pulling the rocket downward.

Scoring Rubric	
Score	Description
2	Both parts are answered correctly: Part A: Student selects option B. Part B: Rocket A experiences a greater net force acting on it over a longer period of time due to a smaller gravitational force pulling the rocket downward.
1	Only one part is answered correctly.
0	The response is incorrect or irrelevant.

(2 Point)

Grade HS Science Sample Test

Item Number	14
Item Title	Bottle Rocket Activity
Domain (Reporting Category)	Physical Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.P3U1.6
SEP	Construct explanations and design solutions
Crosscutting Concepts (CC)	Structure and Function
Phenomenon	A rocket is pushed up against Earth's gravitational field before falling back down to Earth's surface.
TAGS	S3
Item Type	Match

Use **Figure 1** to analyze the interactions in the bottle rocket activity. Determine whether each interaction involves a contact force or a noncontact force.

Move the answers to the correct boxes.

Contact Force

Air pump on air

Air on water

Water on rocket

Air drag on rocket

Noncontact Force

Gravity on water

Gravity on rocket

(Continued on the next page)

(Continued)

Scoring Rubric	
Score	Description
1	Student selects: Air pump on air; Air on water; Water on rocket, and Air drag on rocket for the "Contact Force" box and the two events involving gravity in the "Noncontact Force" box
0	The response is incorrect or irrelevant.

(1 Point)

Grade HS Science Sample Test

Item Number	15
Item Title	Bottle Rocket Activity
Domain (Reporting Category)	Physical Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Investigating
Content Standard	HS.P3U1.6
SEP	Analyze and interpret data
Crosscutting Concepts (CC)	Patterns
Phenomenon	A rocket is pushed up against Earth's gravitational field before falling back down to Earth's surface.
TAGS	G3
Item Type	TPD—Line Graph and Inline Choice

Note: This question has two parts –Part A

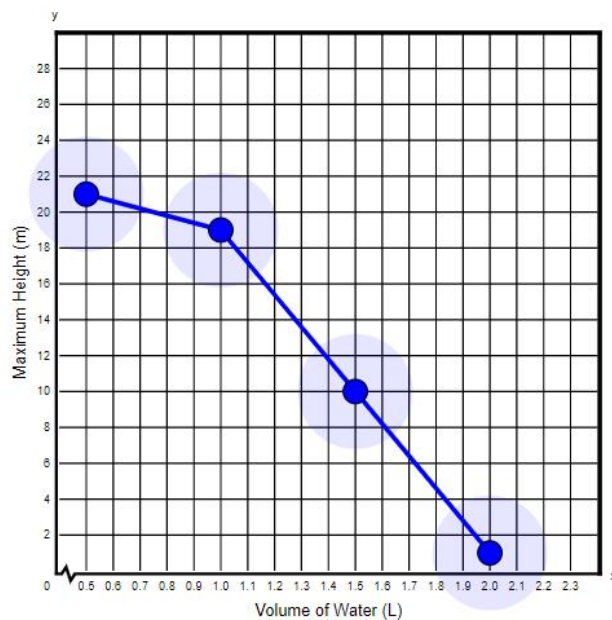
This question has **two** parts. First answer Part A. Then answer Part B.

Part A

Use the data in **Table 1** to graph the relationship between the volume of water and maximum height of the bottle rockets.

Select a location on the coordinate grid to plot each data point from the table. A line segment will connect the points.

Height vs. Volume of Water



(Continued on the next page)

Note: This question has two parts(cont.)–Part B

Part B

Use the graph in Part A to explain the relationship between the volume of water and maximum height of the bottle rockets. Complete the sentences by selecting the correct answers from the drop-down menus.

The rocket with liters of water had the most net force, and the net force increased as the decreased.

Scoring Rubric	
Score	Description
1	Part A; Student plots these four points: (0.5, 21), (1.0, 19), (1.5, 10), (2.0, 1). Part B: The rocket with 0.5 liters of water had the most net force, and the thrust increased as the volume of water decreased.
0	The response is incorrect or irrelevant.

(1 Point) Student selected the correct answer for each part.

Grade HS Science Sample Test

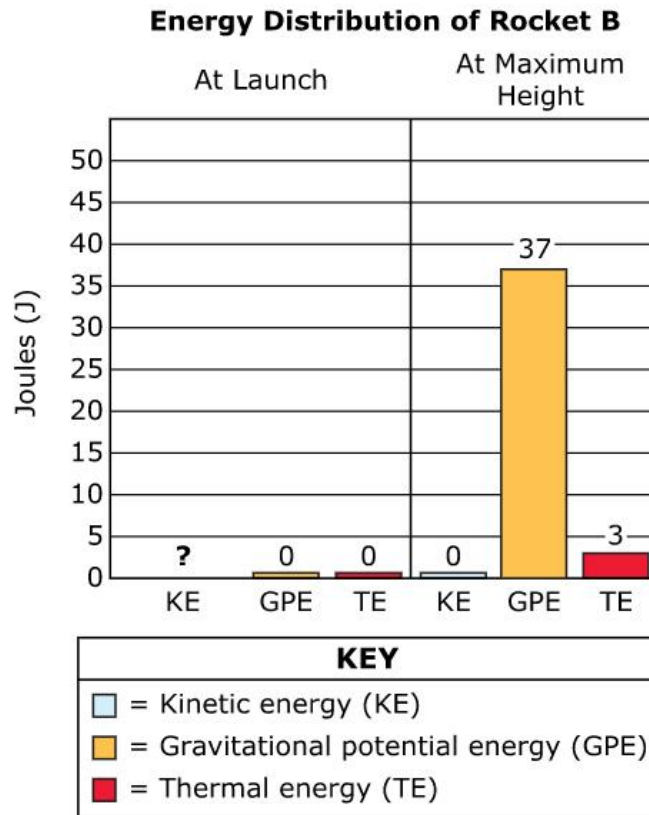
Item Number	16
Item Title	Bottle Rocket Activity
Domain (Reporting Category)	Physical Science
Science and Engineering Practices (SEP) Group (Reporting Category)	Does not contribute
Content Standard	HS.P4U1.8
SEP	Develop and use models
Crosscutting Concepts (CC)	Energy and Matter
Phenomenon	A rocket is pushed up against Earth's gravitational field before falling back down to Earth's surface.
TAGS	S3
Item Type	Gap Match

(Continued on the next page)

(Continued)

Using the model in **Figure 2**, complete the statement to explain the energy distribution of Rocket B during its launch.

Move the correct answer to each box. Not all answers will be used.



From its starting position to its maximum height of 19 m, the initial amount of kinetic energy of Rocket B was , and the thermal energy the external environment was 3 J.

Scoring Rubric	
Score	Description
1	From its starting position to its maximum height of 19 m, the initial amount of kinetic energy of Rocket B was 40 J and the thermal energy lost to the external environment was 3 J.
0	The response is incorrect or irrelevant.

(1 Point)