SY2020
-2021

Idaho Science Sample Test Answer Key

SCIENCE AT HIGH SCHOOL

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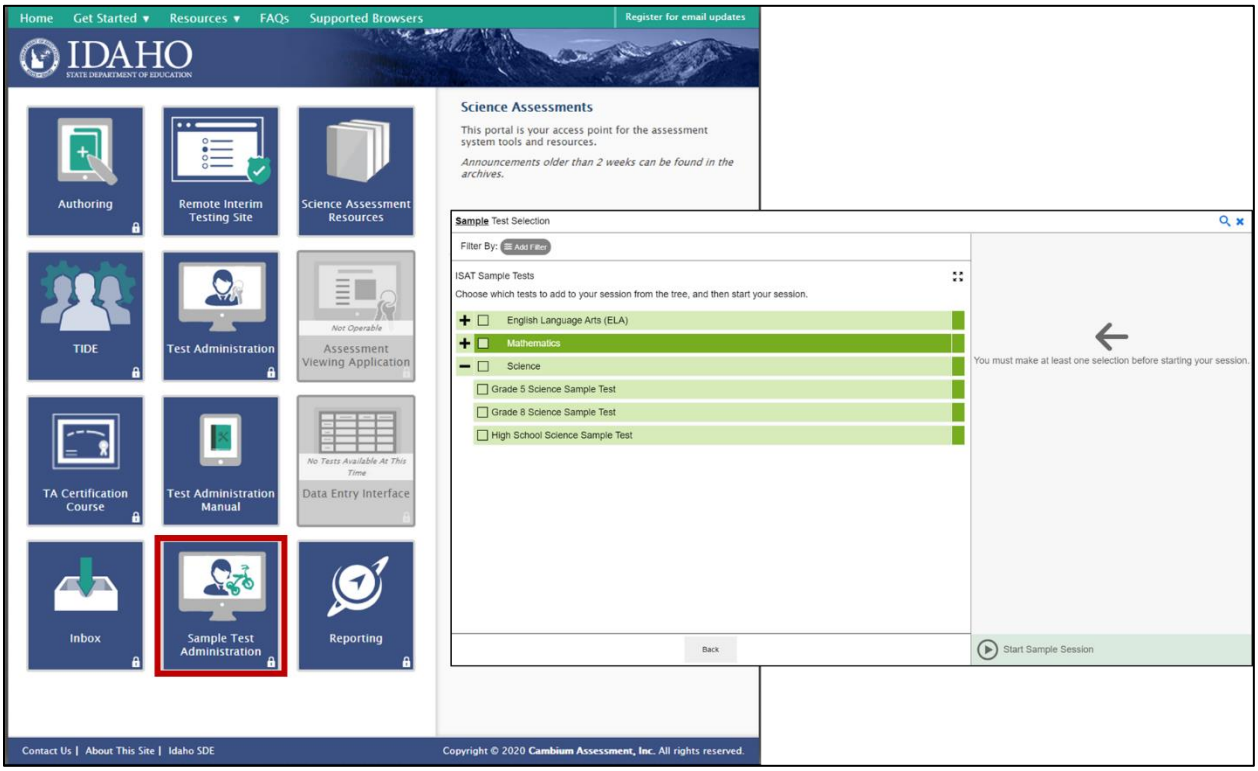
Accessing the Idaho Science Sample Test

The Science Sample Tests are available via the ISAT Portal.

The Science Sample Tests can be administered with the Sample Test Administration panel. A Test Administrator clicks on the Sample Test Administration panel and starts a Sample Test Session. Students can use the Idaho Secure Browser to log in and take a Science Sample Test using their first name, EDUID, and the Sample Test Session number.

Figure 1 shows the Sample Test Administration panel and the Sample Test Selection window.

Figure 1: Sample Test Administration App and the Sample Test Selection Window



A Guest User can also log into with a Guest Session and take a Science Sample Test as many times as he/she would like to take a grade 5, grade 8 or high school science sample test.

To access the Science Sample Tests as a Guest User, click on the Practice & Training Tests panel on the ISAT Portal homepage. From there, click on the Take the Sample/Training Tests panel. A new tab will open, and you can login as a Guest User.

Figure 2 shows the Practice & Training Tests panel.

Figure 2: Practice & Training Tests

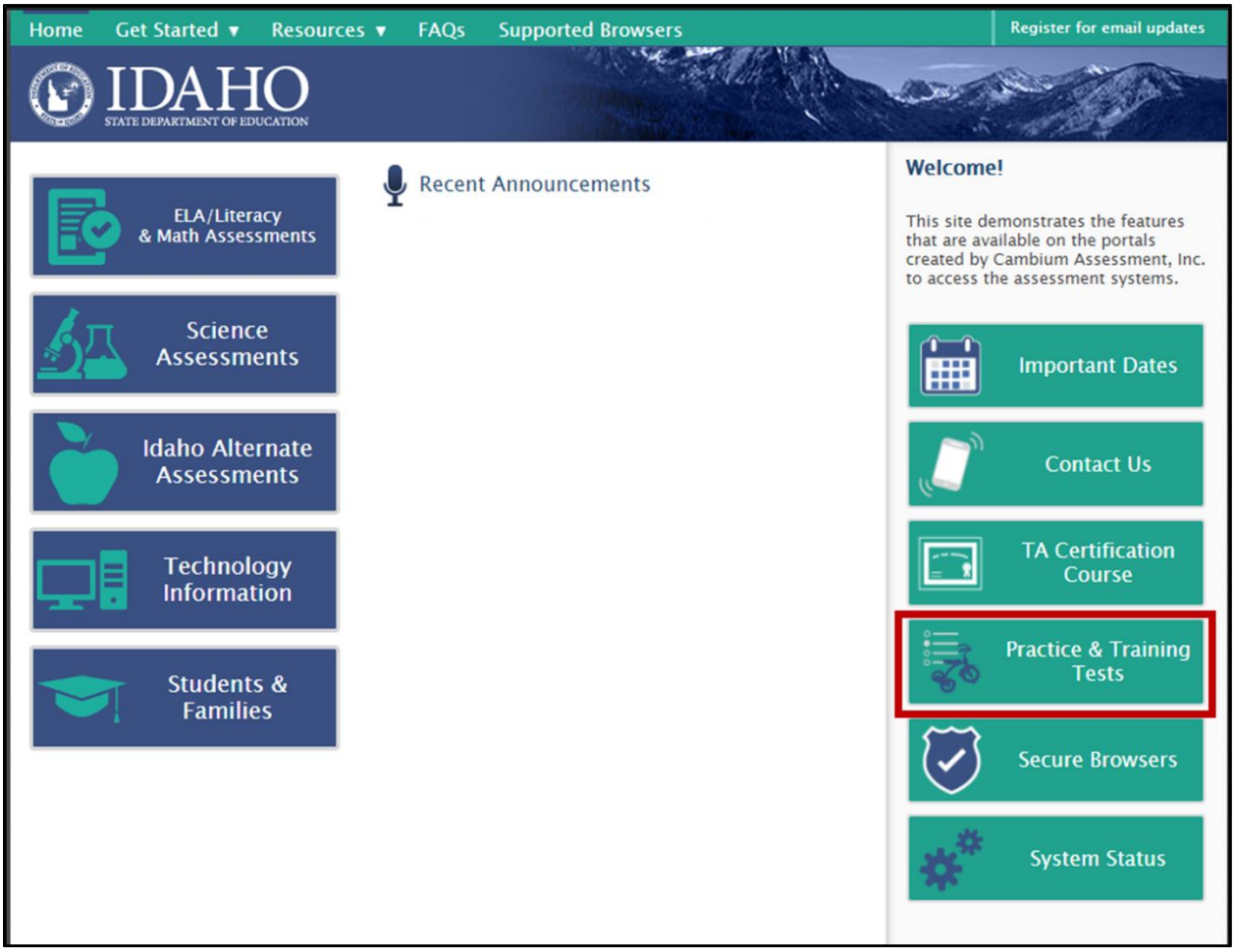
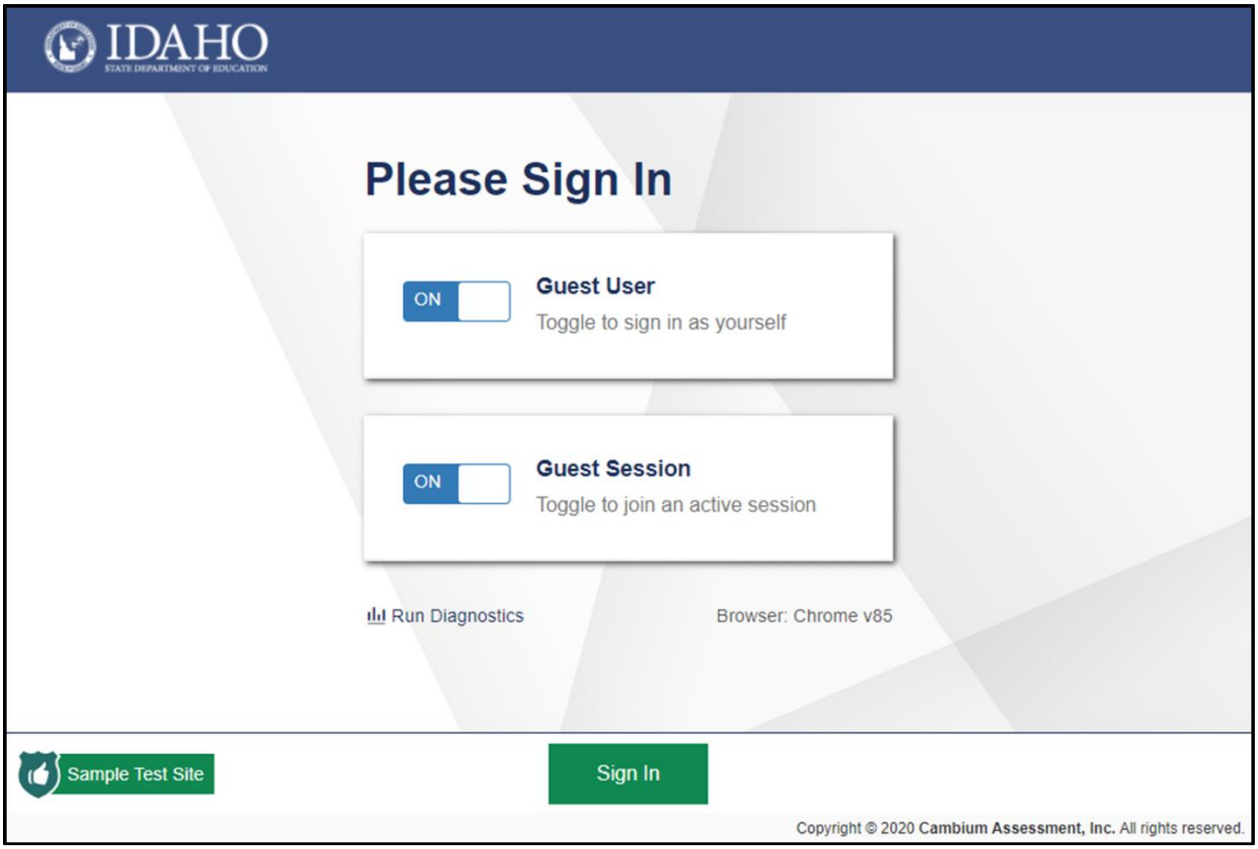


Figure 3 shows the Take the Sample/Training Tests panel.

Figure 3: Take the Sample/Training Tests Panel

Figure 4 shows the Guest User and Guest Session login page.

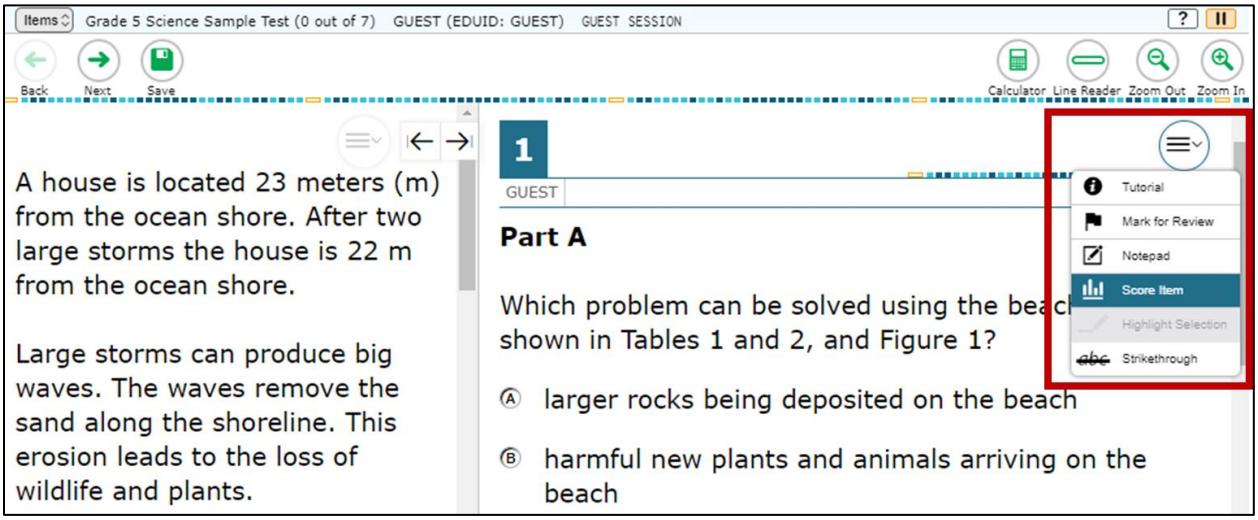
Figure 4: Guest User and Guest Session Login Page



As a Guest User is taking a Science Sample test, he/she can check their score. After answering a few or all of the questions, click on the Context Menu in the upper right corner, and then click on Score Item.

Figure 5 shows the location of the Context Menu and Score Item.

Figure 5: Context Menu and Score Item



Question #1: High School Sample Test

Alignment: PSP1-HS-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

- **SEP:** Constructing Explanations and Designing Solutions
- **Science Content:** PS2.A Forces and Motion & Types of Interactions & ETS1.A Defining and Delimiting and Engineering Problem & ETS1.C Optimizing the Design Solution (Physics)*
- **CCC:** Cause and Effect

Part A

Complete the table to indicate how force is affected by changes in collision properties. Click on each blank box and select the words or phrases that describe how the force affecting the cell phone changes.

- In each scenario, assume that the cell phone is dropped directly down, that it is not thrown or given any extra momentum, and that all of the other variables remain unchanged.

Change in Collision Properties	Change in Force Affecting the Cell Phone
The mass of the cell phone is doubled.	The force
The cell phone automatically powers off during fall.	The force
The change in velocity of the cell phone during the collision is doubled.	The force
The time interval of the collision is doubled.	The force

Options:

- Increases.
- Decreases.
- Is not affected.

Answer:

Change in Collision Properties	Change in Force Affecting the Cell Phone
The mass of the cell phone is doubled.	The force increases.
The cell phone automatically powers off during fall.	The force is not affected.
The change in velocity of the cell phone during the collision is doubled.	The force increases.
The time interval of the collision is doubled.	The force decreases.

Part B

Click on each blank box and select a word or phrase to describe one feature that the cell phone case design must have.

The cell phone case should be designed to [ ] the force on the cell phone in a collision. To do this, the design should [ ]

Options:

- The cell phone case should be designed to
  - Reduce
  - Increase
  - Maximize
  - Eliminate
- The force on the cell phone in a collision. To do this, the design should
  - Increase the mass of the cell phone.
  - Decrease the mass of the cell phone.
  - Increase the time interval of the collision.
  - Decrease the time interval of the collision.
  - Increase the height from which the cell phone falls.
  - Decrease the height from which the cell phone falls.

Answer:

The cell phone case should be designed to reduce the force on the cell phone in a collision. To do this, the design should increase the time interval of the collision.

Part C

The first priority of the design is that the cell phone case should protect the cell phone from damage when it is dropped. However, other criteria can also be considered when designing a cell phone case.

Select **two** more criteria that you would like to prioritize in your design. Click on the blank boxes and select the words or phrases to complete the table.

- Prioritize only **two** design criteria.
- Select "Second" and "Third" for the criteria you would like to designate as second and third priority, respectively.
- For the design criteria **not** prioritized, select "Not prioritized".

Priority	Criteria
First	The cell phone case should protect the cell phone from damage when it is dropped.
	The cell phone case should be easy to grip.
	The cell phone case should be recyclable.
	The cell phone case should be inexpensive.

Answer: Responses may vary based on the student's preferences. The student receives a point for Part C by prioritizing only two criteria.

Part D

Based on your choices in part C, select the material from Table 2 you will use for your cell phone case design.

Ⓐ Material 1

Ⓑ Material 2

Ⓒ Material 3

Ⓓ Material 4

Ⓔ Material 5

Ⓕ Material 6

Answer: Responses will vary based on the student's response in Part C.

Part E

Design parameters

Material number: Material 1

Thickness of cell phone case (mm): 1 mm

Height from which cell phone case is dropped (m):

0.5 m (height of a pocket while seated on a bench)

Start

Prototype	Material	Case thickness (mm)	Height phone is dropped from (m)	% Volume (size) increase of phone	Force on phone (N)

Answer: Responses will vary. The student receives one point for using the material chosen in Part D for all trials; one point for varying the thickness of the case while holding other variables constant; and one point for varying the height the phone is dropped from while holding other variables constant. This is an example of an output table that would receive all three points if the material chosen in Part D is Material 3:

Prototype	Material	Case thickness (mm)	Height phone is dropped from (m)	% Volume (size) increase of phone	Force on phone (N)
1	Material 3	1	0.5	10	4.0
2	Material 3	3	0.5	30	3.7
3	Material 3	5	0.5	50	3.4
4	Material 3	3	1.0	30	5.2

Part F

Based on your prioritized criteria in part C, which prototype worked the best?

Ⓐ Prototype 1

Ⓑ Prototype 2

Ⓒ Prototype 3

Ⓓ Prototype 4

Answer: Responses will vary based on the student's trials in Part E.

Part G

A company wants to produce your cell phone case and sell it to construction workers. Construction workers often work on tall structures.

Select a change to improve the prototype you chose in part F to make it more suitable for construction workers.

Ⓐ The cell phone case needs to be easier to grip.

Ⓑ The cell phone case needs to be less expensive.

Ⓒ The cell phone case needs to add less volume to the cell phone.

Ⓓ The cell phone case needs to protect the cell phone from damage when dropped from a height of more than 3 meters.

Answer: D

Scoring Assertions

Q#	Part	Scoring Assertions
1	A	When asked to predict the change in force on the phone when the mass of the phone is doubled and when the change in velocity is doubled, the student selected that the force increases, providing some evidence that the student can infer from the equations how mass, velocity change, and force are related.
1	A	When asked to predict the change in force on the phone when the phone is powered off during the fall and when the time interval is doubled, the student selected that the force is not affected and decreases, respectively. This provides some evidence that the student understands that force is not affected by the phone turning off and that time is inversely related to force.
1	B	When asked to select a design feature for the phone cover that will be beneficial during a collision, the student selected that the cover should be designed to reduce the force on the phone during collision, providing some evidence of the student's ability to use scientific and engineering thinking to identify design criteria.
1	B	When asked to select how the phone cover will reduce the force on the phone during a collision, the student responded that it should increase the time interval of the collision, providing some evidence of the student's ability to use scientific and engineering thinking to identify design criteria.
1	C	When asked to determine two more criteria to be prioritized in the phone case design, the student selected two priorities, providing some evidence that the student can prepare a design plan.
1	D	When asked to select a material to be used for the design of the phone case prototype, the student chose a material that satisfied the two constraints prioritized in part C, providing some evidence that the student understands how materials can be chosen to satisfy design constraints.
1	E	When asked to use the simulation to develop a prototype of a cell phone cover using the materials chosen in part D, the student runs three or more trials for the chosen material only, providing some evidence of an ability to test a design.
1	E	When asked to use the simulation to develop a prototype of a cell phone cover using the materials chosen in part D, the student varied "thickness of phone case" while holding the other variables constant within two trials, providing some evidence of an ability to test the prototype.
1	E	When asked to use the simulation to develop a prototype of a cell phone cover using the materials chosen in part D, the student varied "height from which phone is dropped" while holding the other variables constant within two trials, providing some evidence of an ability to test the prototype.
1	F	When asked to select which prototype worked the best, the student selected the prototype that satisfies the first criterion in part C as evaluated by a force of less than 8 N on the phone and at least one the other two criteria prioritized in part C, providing some evidence of an ability to evaluate the results of a design.
1	G	When asked to select a way to improve the prototype the student chose in part F to make it more suitable for the construction worker market, the student selected "the cell phone case needs to protect the cell phone from damage when dropped from a height of more than 3 meters", or alternatively if it could be improved by satisfying one of the constraints that the chosen prototype fails to satisfy, providing some evidence of an ability to see weaknesses of the model and to propose refinements.

Question #2: High School Sample Test

Alignment: PSC1-HS-2: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

- **SEP:** Developing and Using Models
- **Science Content:** PS1.A Structure and Properties of Matter & PS2.B Types of Interactions (Chemistry)
- **CCC:** Patterns

Part A

Which element would form structures similar to carbon?

Ⓐ iodine

Ⓑ silicon

Ⓒ lithium

Ⓓ titanium

Answer: B

Part B

Using the periodic table, enter the number of valence electrons that would be contained in the element that forms structures similar to carbon. Enter your answer in the blank box provided.

Number of valence electrons in element: ⌨

Answer: 4

Scoring Assertions

Q#	Part	Scoring Assertions
2	A	When asked which element would form structures similar to carbon, the student selected "silicon", providing some evidence of an understanding that an element in the same group in the periodic table must have the same number of valence electrons in order to form similar structures.
2	B	When asked how many valence electrons the element has, the student entered 4, providing some evidence of an understanding that carbon contains four valence electrons, and an element in the same group in the periodic table must have the same number of valence electrons in order to form similar structures.

Question #3: High School Sample Test

Alignment: LS1-HS-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

- **SEP:** Constructing Explanations and Designing Solutions
- **Science Content:** LS1.C Organization for Matter and Energy Flow in Organisms
- **CCC:** Energy and Matter

Part A

Which claim about the antimicrobial compound is supported by the evidence in Tables 1–3?

Ⓐ The antimicrobial compound is a nucleic acid in the tick's cells.

Ⓑ The antimicrobial compound is a lipid found in the tick's intestine.

Ⓒ The antimicrobial compound is a carbohydrate consumed by the tick.

Ⓓ The antimicrobial compound is a protein produced in the tick's digestive system.

Answer: D

Part B

Select **two** pieces of information that could help determine what type of macromolecule the antimicrobial compound is.

- ☐ elemental composition of protein
- ☐ elemental composition of glucose
- ☐ elemental composition of cholesterol
- ☐ range of concentration of protein in blood
- ☐ range of concentration of glucose in blood
- ☐ range of concentration of cholesterol in blood
- ☐ elemental composition of the antimicrobial compound

Answer:

- ☑ elemental composition of protein
- ☐ elemental composition of glucose
- ☐ elemental composition of cholesterol
- ☐ range of concentration of protein in blood
- ☐ range of concentration of glucose in blood
- ☐ range of concentration of cholesterol in blood
- ☑ elemental composition of the antimicrobial compound

Part C

Select **two** processes that must be understood to explain how the antimicrobial compound is produced in the tick.

- [ ] DNA replication
- [ ] protein synthesis
- [ ] calcium absorption
- [ ] membrane synthesis
- [ ] digestion of macromolecules

Answer:

- [ ] DNA replication
- [x] protein synthesis
- [ ] calcium absorption
- [ ] membrane synthesis
- [x] digestion of macromolecules

Part D

Click on the blank boxes and select phrases for each step to explain the process of antimicrobial compound production in the black-legged tick.

Steps of Antimicrobial Compound Formation

Number	Step
1	
2	
3	
4	
5	

Options:

- Tick consumes the blood of a guinea pig.
- Chains of amino acids are linked and folded.
- Proteins in the blood are broken down into smaller molecules and atoms.
- Amino acids are attached in long chains according to the mRNA sequence.
- Elements from the sugar molecules in the blood are rearranged into amino acids.
- Sugar molecules in the blood are broken down into smaller molecules are atoms.
- Elements from the protein molecules in the blood are rearranged into amino acids.

Answer:

Steps of Antimicrobial Compound Formation

Number	Step
1	Tick consumes the blood of a guinea pig.
2	Sugar molecules in the blood are broken down into smaller molecules and atoms.
3	Elements from the sugar molecules in the blood are rearranged into amino acids.
4	Amino acids are attached in long chains according to the mRNA sequence.
5	Chains of amino acids are linked and folded.

Scoring Assertions

Q#	Part	Scoring Assertions
3	A	The student identified that the evidence in tables 1-3 supports the claim "The antimicrobial compound is a protein produced in the tick's digestive system." This provides some evidence of an ability to determine whether evidence supports a claim about the source of complex molecules synthesized by organisms.
3	B	The student identified that the elemental composition of protein would support the claim of what type of macromolecule the antimicrobial compound is. This provides some evidence of an ability to identify evidence that supports or contradicts a claim about how an organism synthesizes complex molecules.
3	B	The student identified that the elemental composition of the antimicrobial compound would support the claim of what type of macromolecule the antimicrobial compound is. This provides some evidence of an ability to identify evidence that supports or contradicts a claim about how an organism synthesizes complex molecules.
3	C	The student identified that protein synthesis is a process that must be understood in order to explain how the antimicrobial compound is produced in the tick, providing some evidence of an ability to select process or relationships that must be understood in order to explain how organisms can synthesize complex molecules from the elements found in sugar molecules.
3	C	The student identified that the digestion of macromolecules is one process that must be understood in order to explain how the antimicrobial compound is produced in the tick, providing some evidence of an ability to select process or relationships that must be understood in order to explain how organisms can synthesize complex molecules from the elements found in sugar molecules.
3	D	The student identified that the "Tick consumes the blood of a guinea pig" is the step directly before " Sugar molecules in the blood are broken down into smaller molecules and atoms" in the step by step explanation of how the antimicrobial compound is produced, providing some evidence of an ability to construct an explanation of how complex molecules can be made using the elements from sugar molecules.
3	D	The student identified that "Sugar molecules in the blood are broken down into smaller molecules and atoms" is the step directly before "Elements from the sugar molecules in the blood are rearranged into amino acids" in the step by step explanation of how the antimicrobial compound is produced, providing some evidence of an ability to construct an explanation of how complex molecules can be made using the elements from sugar molecules.
3	D	The student identified that "Elements from the sugar molecules in the blood are rearranged into amino acids" is the step directly before "Amino acids are attached in long chains according to the mRNA sequence" in the step by step explanation of how the antimicrobial compound is produced, providing some evidence of an ability to construct an explanation of how complex molecules can be made using the elements from sugar molecules.
3	D	When asked to create a step-by-step explanation of how the tick makes the antimicrobial compound, the student selected "Amino acids are attached in long chains according to the mRNA sequence" directly before "Polypeptides are linked and folded", providing some evidence of an ability to construct an explanation of how complex molecules can be made using the elements from sugar molecules.

Question #4: High School Sample Test

Alignment: LS2-HS-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

- **SEP:** Constructing Explanations and Designing Solutions
- **Science Content:** LS2.C Ecosystem Dynamics, Functioning and Resilience & LS4.D Biodiversity and Humans
- **CCC:** Stability and Change

Part A

Select boxes in the table to identify the potential outcome(s) for each solution.

- More than one box can be selected in each row.

Solution	Negative Impact on the Surrounding Environment	Positive Impact on the Number of Mating Females	Negative Impact on Commercial Fishing Industry
Catch restrictions	☐	☐	☐
Restore seagrass beds	☐	☐	☐
Natural predator removal	☐	☐	☐

Answer:

Solution	Negative Impact on the Surrounding Environment	Positive Impact on the Number of Mating Females	Negative Impact on Commercial Fishing Industry
Catch restrictions	☐	☑	☑
Restore seagrass beds	☐	☑	☐
Natural predator removal	☑	☑	☐

Part B

Select **two** solutions that, when combined, would be the **best** method to help increase the population of blue crabs in the Chesapeake Bay. Then, select an explanation for the two methods you chose.

Solution Combinations	Explanation

Options:

- Solution Combinations:
  - Catch restrictions and restore seagrass beds
  - Catch restrictions and natural predator removal
  - Restore seagrass beds and natural predator removal
- Explanation
  - Increased nutrients, habitat availability and biodiversity
  - Increased nutrients and biodiversity; decreased predators
  - Increased habitat availability and biodiversity; decreased predators

Answer:

Solution Combinations	Explanation
Catch restrictions and restore seagrass beds	Increased nutrients, habitat availability and biodiversity

Scoring Assertions

Q#	Part	Scoring Assertions
4	A	The student selected "Positive impact on the number of mating females" and "Negative impact on commercial fishing industry" for Catch Restrictions, "Positive impact on the number of mating females" for Restore seagrass beds and "Negative impact on the surrounding environment" and "Positive impact on the number of mating females" for Natural predator removal. This provides some evidence of an ability to evaluate and describe outcomes of different solutions used improve the environment and biodiversity.
4	B	The student identified catch restrictions and restore seagrass beds as the combination because this method would result in Increased nutrients, habitat availability and biodiversity. This provides evidence of an ability to evaluate and revise a solution to resolve or improve the impact of human activities on the environment and biodiversity and evaluate the outcomes.

Question #5: High School Sample Test

Alignment: ESS2-HS-7: Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

- **SEP:** Engaging in Argument from Evidence
- **Science Content:** ESS2.D Weather and Climate & ESS2.E Biogeology
- **CCC:** Stability and Change

Part A

Based on Figure 1, enter numbers in the blank boxes to indicate the percentage of each atmospheric gas for each time period.

Atmospheric Gas	3 bya	2 bya	1 bya
CO_2	%	%	%
O_2	%	%	%
N_2 (and trace gases)	%	%	%

Answer:

Atmospheric Gas	3 bya	2 bya	1 bya
CO_2	26 %	2 %	1 %
O_2	0 %	2 %	5.5 %
N_2 (and trace gases)	74 %	96 %	93.5 %

Part B

Select **two** statements that are supported by Figure 1 and your answers to part A.

- [ ] CO_2 and O_2 have an inverse relationship.
- [ ] CO_2 and O_2 are currently equal in abundance.
- [ ] O_2 began increasing only one billion years ago.
- [ ] N_2 was the most abundant gas for two billion years.
- [ ] There is no relationship between CO_2 and O_2 abundance.

Answer:

- [x] CO_2 and O_2 have an inverse relationship.
- [ ] CO_2 and O_2 are currently equal in abundance.
- [ ] O_2 began increasing only one billion years ago.
- [x] N_2 was the most abundant gas for two billion years.
- [ ] There is no relationship between CO_2 and O_2 abundance.

Part C

Select the sentences in order to complete the causal chain describing the relationship between the appearance of cyanobacteria and the decline of anaerobic organisms.

- Click on the pencil icon.
- Then, click on a highlighted sentence from the list with the pencil to make your first selection.
- Click on the next pencil icon(s) to make another selection.
- Click on the circular arrow that follows any selection you would like to change.

Sentences:

- CO_2 percentages increase.
- N_2 percentages drop in the atmosphere.
- Cyanobacteria use more CO_2 to produce energy.
- Increased solar output alters cyanobacteria productivity.
- O_2 percentages increase, favoring aerobic species over anaerobic species.
- Anaerobic organisms use more O_2 to produce energy, allowing them to outcompete aerobic species.

Answer:

Increased solar output alters cyanobacteria productivity.

↓

Cyanobacteria use more CO_2 to produce energy.

↓

O_2 percentages increase, favoring aerobic species over anaerobic species.

Part D

Which statement describes why the abundance of anaerobic organisms changed, starting three bya?

Ⓐ Anaerobic organisms could not survive the increased solar radiation.

Ⓑ Anaerobic organisms no longer had access to abundant CO_2 in the atmosphere.

Ⓒ Anaerobic organisms were consumed by aerobic organisms during energy production.

Ⓓ Anaerobic organisms adjusted to the environment by evolving into aerobic organisms.

Answer: B

Scoring Assertions

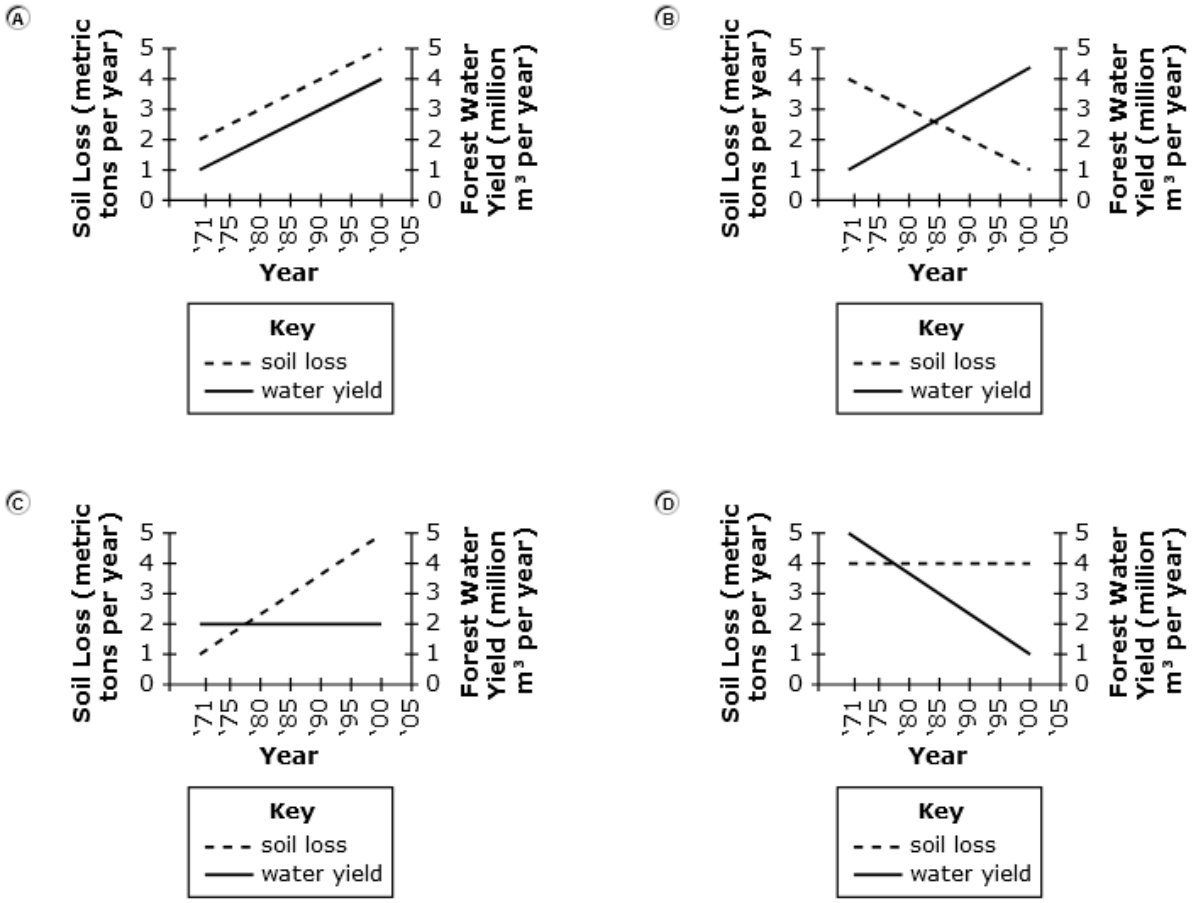
Q#	Part	Scoring Assertions
5	A	When asked to enter the percentage of each atmospheric gas for each time period using Figure 1, the student entered between 25% and 27% for carbon dioxide, between 0% and 1% for oxygen, and the remaining difference as the percentage for nitrogen, at three billion years. This provides some evidence of an ability to use data to identify patterns to determine the change in Earth's systems and life.
5	A	When asked to enter the percentage of each atmospheric gas for each time period using Figure 1, the student entered between 1% and 3% for carbon dioxide, between 1% and 3% for oxygen, and the remaining difference as the percentage for nitrogen, at two billion years. This provides some evidence of an ability to use data to identify patterns to determine the change in Earth's systems and life.
5	A	When asked to enter the percentage of each atmospheric gas for each time period using Figure 1, the student entered between 0% and 2% for carbon dioxide, between 4% and 6% for oxygen, and the remaining difference as the percentage for nitrogen, at two billion years. This provides some evidence of an ability to use data to identify patterns to determine the change in Earth's systems and life.
5	B	When asked to select two statements that are supported by Figure 1 and the answers to part A, the student selected "CO2 and O2 have an inverse relationship." This provides some evidence of an ability to use data to identify patterns and describe Earth's past atmosphere.
5	B	When asked to select two statements that are supported by Figure 1 and the answers to part A, the student selected "N2 was the most abundant gas for two billion years." This provides some evidence of an ability to use data to identify patterns and describe Earth's past atmosphere.
5	C	When asked to complete the causal chain describing the relationship between anaerobic organisms and cyanobacteria, the student selected "Cyanobacteria use more CO2 to produce energy" after "Increased solar radiation alters cyanobacteria productivity." This provides some evidence of an ability to complete a causal chain describing how life on Earth changed with Earth's systems.
5	C	When asked to complete the causal chain describing the relationship between anaerobic organisms and cyanobacteria, the student selected "O2 percentages increase, favoring aerobic species over anaerobic species" after "Cyanobacteria use more CO2 to produce energy." This provides some evidence of an ability to complete a causal chain describing how life on Earth changed with Earth's systems.
5	D	When asked which statement describes the change in the abundance of anaerobic organisms three billion years ago, the student selected "Anaerobic organisms no longer had access to abundant CO2 in the atmosphere." This provides some evidence of an ability to create a claim using evidence on the development of Earth's systems and coevolution with life.

Question #6: High School Sample Test

Alignment: ESS3-HS-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

- **SEP:** Using Mathematics and Computational Thinking
- **DCI:** ESS2.D Weather and Climate & ESS3.D Global Climate Change
- **CCC:** Systems and System Models

Based on the information in Figure 1, which model best describes the relationship between forest density, the amount of water a forest supplies (Forest Water Yield) and the amount of soil loss in South Korea between 1971 and 2005?



Answer: B

Scoring Assertions

Q#	Scoring Assertion
6	The student selected the graph showing a decrease in soil loss and an increase in forest water yield. This provides some evidence that the student is able to use models to estimate the effects of afforestation on Earth systems.