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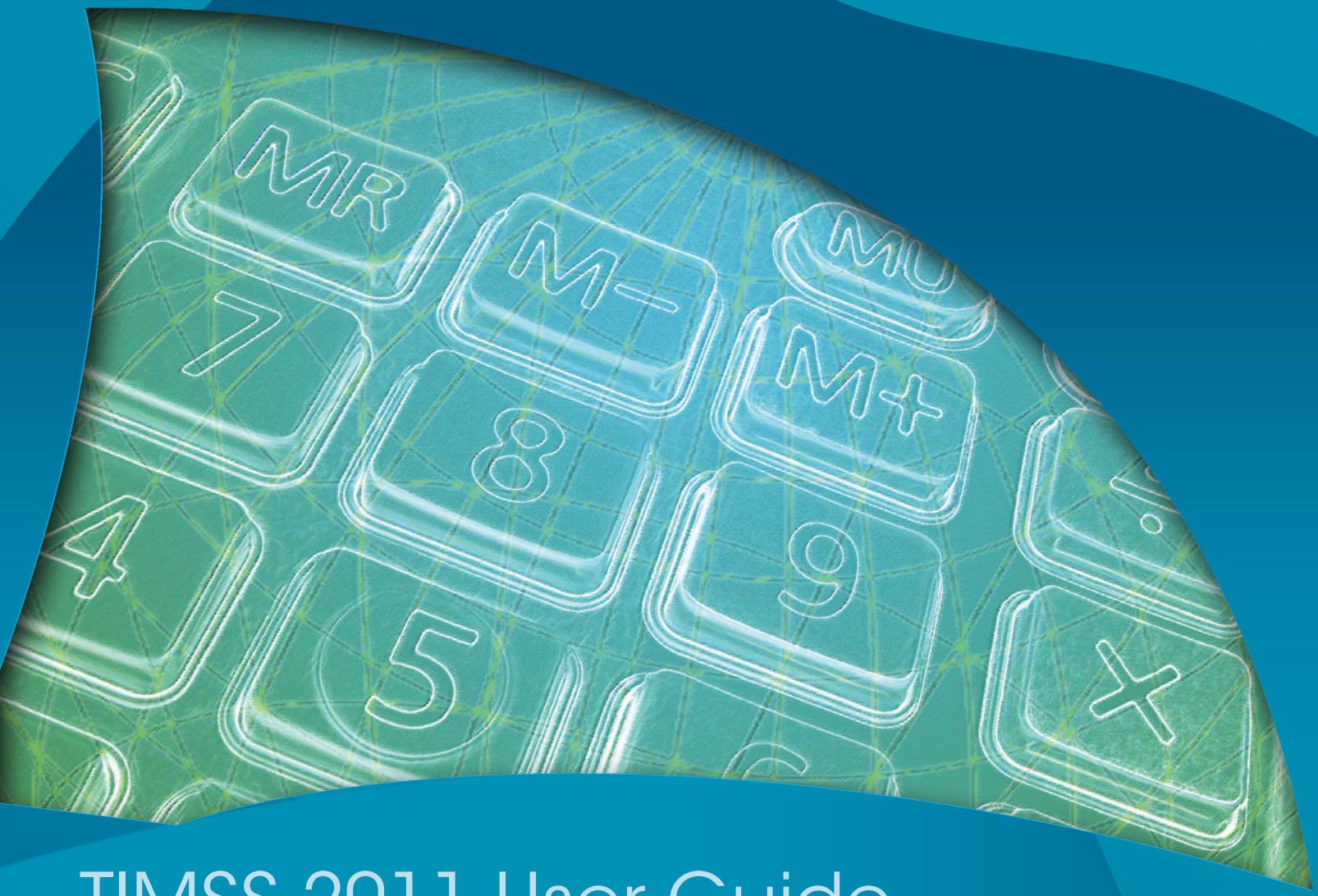

TIMSS 2011 User Guide for the International Database

Released Items

Science – Eighth Grade

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TIMSS 2011 User Guide for the International Database
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Publishers: TIMSS & PIRLS International Study Center,
Lynch School of Education, Boston College
and
International Association for the Evaluation of Educational Achievement (IEA)

Library of Congress Catalog Card Number: 2013930046
ISBN-13: 978-1-889938-13-4

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Item ID	Subject	Grade	Block	Block Seq	Content Domain	Cognitive Domain	Maximum Points	Key
S032611	S	8	S01	01	Biology	Knowing	1	A
S032614	S	8	S01	02	Biology	Applying	1	See scoring guide
S032451	S	8	S01	03	Biology	Applying	2	See scoring guide
S032156	S	8	S01	04	Chemistry	Reasoning	1	C
S032056	S	8	S01	05	Chemistry	Applying	1	See scoring guide
S032087	S	8	S01	06	Biology	Knowing	1	C
S032279	S	8	S01	07	Physics	Applying	1	D
S032238	S	8	S01	08	Physics	Applying	1	A
S032369	S	8	S01	09	Physics	Applying	2	See scoring guide
S032160	S	8	S01	10	Earth Science	Knowing	1	C
S032654	S	8	S01	11	Earth Science	Reasoning	1	A
S032126	S	8	S01	12	Earth Science	Knowing	1	See scoring guide
S032510	S	8	S01	13	Earth Science	Knowing	1	D
S032158	S	8	S01	14	Physics	Knowing	1	B
S052093	S	8	S02	01	Biology	Applying	1	C
S052088	S	8	S02	02	Biology	Applying	1	A
S052030	S	8	S02	03	Biology	Reasoning	1	B
S052080	S	8	S02	04	Biology	Knowing	1	D
S052091	S	8	S02	05	Biology	Reasoning	1	See scoring guide
S052152	S	8	S02	06	Chemistry	Applying	1	C
S052136	S	8	S02	07	Chemistry	Reasoning	1	See scoring guide
S052046	S	8	S02	08	Chemistry	Knowing	1	D
S052254	S	8	S02	09	Chemistry	Reasoning	1	A
S052207	S	8	S02	10	Physics	Knowing	1	See scoring guide
S052165A	S	8	S02	11	Physics	Knowing	1	See scoring guide
S052165B	S	8	S02	11	Physics	Knowing	1	See scoring guide
S052165C	S	8	S02	11	Physics	Reasoning	1	See scoring guide
S052297	S	8	S02	12	Earth Science	Knowing	1	B
S052032	S	8	S02	13	Earth Science	Reasoning	1	See scoring guide
S052106	S	8	S02	14	Earth Science	Applying	1	See scoring guide
S042304	S	8	S03	01	Biology	Reasoning	1	D
S042038	S	8	S03	02	Biology	Knowing	1	A
S042298	S	8	S03	03	Biology	Applying	1	See scoring guide
S042261	S	8	S03	04	Biology	Knowing	1	See scoring guide
S042051A	S	8	S03	05	Biology	Applying	1	See scoring guide
S042051B	S	8	S03	05	Biology	Applying	1	See scoring guide
S042076	S	8	S03	06	Chemistry	Knowing	1	See scoring guide
S042404	S	8	S03	07	Physics	Applying	2	See scoring guide
S042306	S	8	S03	08	Chemistry	Knowing	1	C
S042403	S	8	S03	09	Physics	Reasoning	1	See scoring guide
S042272	S	8	S03	10	Physics	Knowing	1	A
S042100	S	8	S03	11	Chemistry	Knowing	2	See scoring guide
S042238A	S	8	S03	12	Physics	Knowing	1	C
S042238B	S	8	S03	12	Physics	Reasoning	1	See scoring guide
S042238C	S	8	S03	12	Physics	Reasoning	1	See scoring guide
S042141	S	8	S03	13	Earth Science	Knowing	1	B

Item ID	Subject	Grade	Block	Block Seq	Content Domain	Cognitive Domain	Maximum Points	Key
S042215	S	8	S03	14	Earth Science	Applying	1	D
S032542	S	8	S05	01	Biology	Applying	1	B
S032645	S	8	S05	02	Biology	Knowing	1	A
S032530A	S	8	S05	03	Biology	Knowing	1	See scoring guide
S032530B	S	8	S05	03	Biology	Knowing	1	See scoring guide
S032530Z	S	8	S05	03	Biology	Knowing	2	Derived*
S032007	S	8	S05	04	Biology	Knowing	1	See scoring guide
S032502	S	8	S05	05	Chemistry	Applying	1	C
S032679	S	8	S05	06	Chemistry	Applying	1	See scoring guide
S032184	S	8	S05	07	Physics	Applying	1	D
S032394	S	8	S05	08	Physics	Applying	1	C
S032151	S	8	S05	09	Earth Science	Knowing	1	B
S032651A	S	8	S05	10	Earth Science	Applying	1	See scoring guide
S032651B	S	8	S05	10	Earth Science	Reasoning	1	See scoring guide
S032665A	S	8	S05	11	Biology	Reasoning	1	See scoring guide
S032665B	S	8	S05	11	Biology	Reasoning	1	See scoring guide
S032665C	S	8	S05	11	Biology	Reasoning	1	See scoring guide
S042073	S	8	S06	01	Chemistry	Knowing	1	B
S042017	S	8	S06	02	Biology	Applying	1	D
S042007	S	8	S06	03	Biology	Applying	1	B
S042024	S	8	S06	04	Biology	Knowing	1	B
S042095	S	8	S06	05	Chemistry	Knowing	1	D
S042022	S	8	S06	06	Biology	Reasoning	1	See scoring guide
S042063	S	8	S06	07	Chemistry	Applying	1	A
S042197	S	8	S06	08	Physics	Reasoning	1	C
S042297	S	8	S06	09	Biology	Reasoning	2	See scoring guide
S042305	S	8	S06	10	Chemistry	Applying	2	See scoring guide
S042112	S	8	S06	11	Chemistry	Knowing	1	D
S042173A	S	8	S06	12	Physics	Applying	1	See scoring guide
S042173B	S	8	S06	12	Physics	Applying	1	See scoring guide
S042173C	S	8	S06	12	Physics	Applying	1	See scoring guide
S042173D	S	8	S06	12	Physics	Applying	1	See scoring guide
S042173E	S	8	S06	12	Physics	Applying	1	See scoring guide
S042173Z	S	8	S06	12	Physics	Applying	2	Derived*
S042407	S	8	S06	13	Physics	Applying	1	See scoring guide
S042278	S	8	S06	14	Physics	Applying	1	See scoring guide
S042274	S	8	S06	15	Physics	Knowing	1	D
S042317	S	8	S06	17	Earth Science	Applying	2	See scoring guide
S032465	S	8	S07	01	Biology	Knowing	1	A
S032315	S	8	S07	02	Biology	Reasoning	1	D
S032306	S	8	S07	03	Biology	Applying	2	See scoring guide
S032640	S	8	S07	04	Biology	Knowing	1	See scoring guide
S032579	S	8	S07	05	Chemistry	Applying	1	B
S032570	S	8	S07	06	Chemistry	Reasoning	1	See scoring guide
S032024	S	8	S07	07	Physics	Knowing	1	C
S032272	S	8	S07	08	Physics	Reasoning	1	See scoring guide

Item ID	Subject	Grade	Block	Block Seq	Content Domain	Cognitive Domain	Maximum Points	Key
S032141	S	8	S07	09	Physics	Applying	1	D
S032060	S	8	S07	10	Earth Science	Applying	1	See scoring guide
S032463	S	8	S07	11	Earth Science	Knowing	1	D
S032650A	S	8	S07	12	Earth Science	Applying	1	See scoring guide
S032650B	S	8	S07	12	Earth Science	Applying	1	See scoring guide
S032650Z	S	8	S07	12	Earth Science	Applying	2	Derived*
S032514	S	8	S07	13	Biology	Applying	1	C

* For details about how score points were awarded for each derived item, please see "Reviewing the TIMSS and PIRLS 2011 Achievement Item Statistics" in Methods and Procedures in TIMSS and PIRLS 2011: http://timssandpirls.bc.edu/methods/t-achievement-scales.html

S032611

Which of the following best describes the purpose of cellular respiration?

Ⓐ to provide energy for cell activities
Ⓑ to produce sugar for storage in cells
Ⓒ to release oxygen for breathing
Ⓓ to supply carbon dioxide for photosynthesis

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Content Domain

Biology

Topic Area

Cells and Their Functions

Cognitive Domain

Knowing

Maximum Points

1

Key

A

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S032614

Kidneys are organs found in the human body. When he was young, a man had one of his two kidneys removed because it was diseased. He now has a son.

How many kidneys did his son have at birth? _____

Explain your answer.

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Content Domain

Biology

Topic Area

Life Cycles, Reproduction, and Heredity

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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Note: To receive credit, a response must indicate TWO and include a correct explanation. Credit is given both for responses that explicitly refer to heredity or genetics (Code 10) as well as those based only on humans (normally) having two kidneys at birth (Code 11). Responses that indicate TWO with no explanation or an incorrect explanation are scored as incorrect (Code 70).

Code	Response	Item: S032614
	Correct Response	
10	**TWO** with an explanation based on the removal of a kidney not being a hereditary trait (or similar). *Examples:* *Removal of his kidney is not in his genes, so it will not be passed on.* *It's not hereditary.* *The son's genes are not altered just because his father's kidney is removed.* *There is not a genetic effect.*	
11	**TWO** with an explanation based on all humans (normally) having two kidneys at birth (or similar). [No explicit mention of heredity.] *Examples:* *Everybody is born with two kidneys unless they have a disease.* *His child would still have the normal number, which is 2.* *You always have two kidneys at birth.* *The father's disease is not a spreading disease.* *The human body has two kidneys.* *Just because he has one kidney left does not mean his son will only have one kidney.* *His kidney was removed, but not his son's.* *That is how many most people have.* *This will not affect his son directly.*	
19	Other correct	
	Incorrect Response	
70	**TWO** with no explanation or an incorrect explanation. *Examples:* *The mother still has two kidneys, and this is dominant.* *The son inherited two kidneys from his mother.* *Because the kidney was removed when the father was young.*	
71	**ONE** with or without explanation.	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032451

Some birds eat snails. A species of snail that lives in the forest has a dark shell. The same species of snail that lives in a field has a light-colored shell. Explain how this difference in shell colors helps the snails to survive.

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Content Domain

Biology

Topic Area

Diversity, Adaptation, and Natural Selection

Cognitive Domain

Applying

Maximum Points

2

Key

See scoring guide

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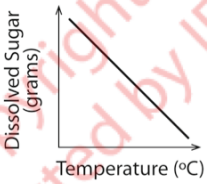
Note: For full credit, explanations must refer to camouflage (blending in with surroundings, or similar) either with or without an explicit mention of protection from predators (Code 20 or 21). Partial credit is given for responses that only mention not being seen or eaten by predators without explicit mention of camouflage (Code 10). Responses that mention **only** that it is dark in the forest or light in the field with no further explanation are scored as incorrect (Code 70).

Code	Response	Item: S032451
	Correct Response	
20	Explanation refers explicitly to **BOTH** camouflage (blending in with surroundings, or similar) **AND** protection from birds, predators, enemies, etc. *Examples:* *The snails in the forest have a dark shell because it will camouflage with the dark colors of the forest. The species that lives in the field will camouflage with the light colors. In both cases, the predators will find it harder to find them.* *The snails that live in the forest have dark shells so the birds cannot see them to eat them.* *The shells help the snails blend in with its habitat so they won't be seen as easily.* *Dark shelled snails in the dark forest use the color to protect themselves from being seen by people.* *Camouflage from its enemies.*	
21	Explanation refers **only** to camouflage, blending in with surroundings, or similar. [Protection from predators NOT explicitly mentioned.] *Examples:* *It helps the snail to camouflage with their surroundings.* *It enables them to blend in with their surroundings.* *The different shell colors helps them to camouflage and adapt to the environment to survive.*	
29	Other fully correct	
	Partially Correct Response	
10	Explanation refers **only** to not being eaten or seen by predators. [Camouflage NOT referenced.] *Examples:* *So the birds will not eat them.* *They can hide from the birds.* *It protects them from predators.*	
19	Other partially correct	
	Incorrect Response	
70	Mentions **only** that it is dark in the forest and light in the field. [Does not explicitly refer to camouflage, protection from predators, or similar.] *Examples:* *The forest is darker than the field.* *The dark snails like it in the dark forest.* *The light is brighter in the field, so the snail is lighter.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

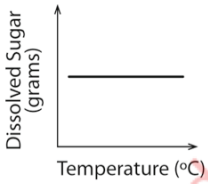
Bob did an experiment to investigate the effect of temperature on the solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 liter of water at different temperatures. He then plotted his results.

Which of the following is likely to be the graph showing Bob's results?

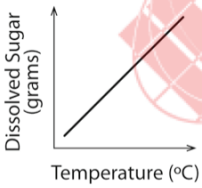
Ⓐ



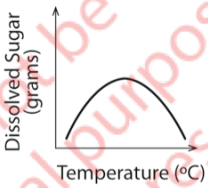
Ⓑ



Ⓒ



Ⓓ



S032156

Content Domain

Chemistry

Topic Area

Properties of Matter

Cognitive Domain

reasoning

Maximum Points

1

Key

C

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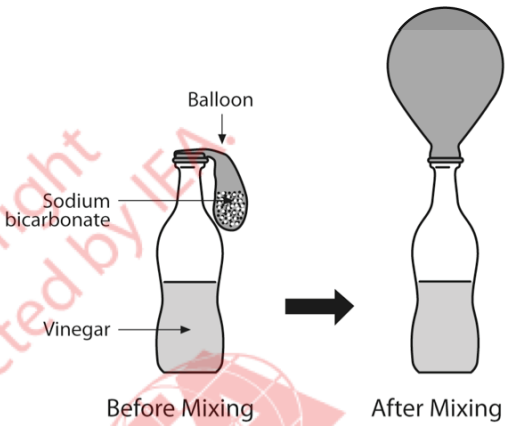

As shown in the diagram, the balloon inflates when the sodium bicarbonate in the balloon is mixed with the vinegar.

What causes this to happen?

S032056

Content Domain

Chemistry

Topic Area

Chemical Change

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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Note: Priority is given to Code 10. If release of carbon dioxide is mentioned, then Code 10 should be given even if other correct codes apply. If an incorrect gas is named (e.g., helium, air, oxygen), then Code 71 should be used.

Code	Response	Item: S032056
	Correct Response	
10	States that **carbon dioxide** is given off (as a result of chemical reaction). *Examples:* *Chemical reaction expels carbon dioxide which blows the balloon up.* *When they mix, carbon dioxide is given off, which eventually inflates the balloon.* *When sodium bicarbonate reacts with vinegar, carbon dioxide is produced.*	
11	States that a **gas** is given off (as a result of chemical reaction). [Does NOT explicitly mention carbon dioxide.] *Examples:* *When they mix the two chemicals, a gas is produced and it goes up into the balloon.* *They create a chemical reaction which releases gas.* *A gas that is produced causes the balloon to inflate.* *It gives off gas which inflates the balloon.*	
12	States that a **chemical reaction** occurs. [Does NOT explicitly mention gas production.] *Examples:* *Vinegar has a reaction when it is mixed with sodium bicarbonate.* *A chemical reaction occurs.* *Because of the reaction between vinegar and sodium bicarbonate.* *It made a reaction and fizzed up.*	
19	Other correct	
	Incorrect Response	
70	Refers only to gas (air) rising into the balloon, or similar. [No mention of chemical reaction or gas production.] *Examples:* *Gas becomes hot and rises into the balloon.* *When they mixed it caused gas to rise up.* *The air wants to rise.*	
71	Refers to production of air, helium or some other incorrect gas. *Examples:* *They mix and make air to fill the balloon.* *The reaction causes helium to be released which fills the balloon.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032087

Which of the following can provide the human body with long-term immunity against some diseases?

Ⓐ antibiotics
Ⓑ vitamins
Ⓒ vaccines
Ⓓ red blood cells

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Content Domain

Biology

Topic Area

Human Health

Cognitive Domain

Knowing

Maximum Points

1

Key

C

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S032279

A man climbed to the top of a very high mountain. While on the mountain top, he drank all the water in his plastic water bottle and then put the cover back on. When he returned to camp in the valley, he discovered that the empty bottle had collapsed.

Which of the following best explains why this happened?

Ⓐ The temperature is lower in the valley than on the mountain top.

Ⓑ The temperature is higher in the valley than on the mountain top.

Ⓒ Air pressure in the valley is lower than on the mountain top.

Ⓓ Air pressure in the valley is higher than on the mountain top.

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Content Domain

Physics

Topic Area

Forces and Motion

Cognitive Domain

Applying

Maximum Points

1

Key

D

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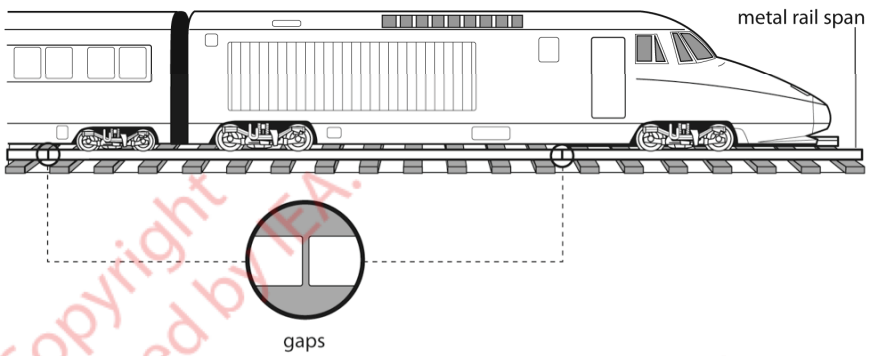

Which of the following best explains why some railroad tracks are laid down with gaps between the metal rail spans?

Ⓐ To allow for the metal tracks to expand on hot days.

Ⓑ To allow for the metal tracks to expand on cold days.

Ⓒ To allow for cooling of the tracks by air in the gaps.

Ⓓ To allow for vibration of the tracks due to the train.

S032238

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Applying

Maximum Points

1

Key

A

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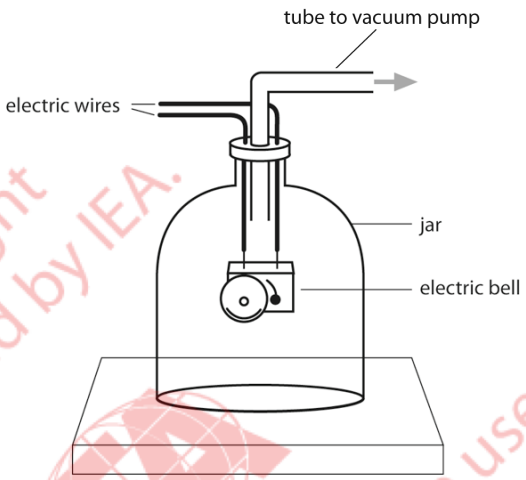

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The diagram shows an electric bell inside a jar. The electric bell is switched on and a ringing sound is heard. The air is then pumped out of the jar.

What will happen to the sound of the bell when the air is pumped out of the jar? Explain your answer.

S032369

Content Domain

Physics

Topic Area

Light and Sound

Cognitive Domain

Applying

Maximum Points

2

Key

See scoring guide

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Note: For full credit, responses must refer to sound fading (or similar) AND give an explanation that explicitly refers to sound needing a medium to travel through (or similar). Partial credit is given for responses that refer to sound fading with no further explanation (Code 10) or minimal explanations that refer only to the vacuum or lack of air in the jar (Code 11). Responses that refer to sound disappearing (or similar) with an incorrect explanation indicating a misconception about the production or transmission of sound are scored as incorrect (Code 70).

Code	Response	Item: S032369
	Correct Response	
20	Refers to sound fading AND explains that sound needs a medium to travel through (or similar). *Examples:* *The sound will die out because if there is no air, then it cannot transfer the sound.* *The sound will fade. Sound waves require a medium to propagate.* *Sound is carried through air. So, there is nothing to carry out sound and it goes away.*	
29	Other fully correct	
	Partially Correct Response	
10	Refers to sound fading (or similar) with NO further explanation. *Examples:* *The sound goes away.*	
11	Refers to sound fading with a minimal explanation that refers only to the vacuum or lack of air. [Does not explicitly refer to sound needing a medium to travel through.] *Examples:* *It fades because all the air is gone.* *It gets fainter because of the vacuum.* *The vacuum stops you from hearing the sound.*	
19	Other partially correct	
	Incorrect Response	
70	Refers to sound disappearing (or similar) with an incorrect explanation that reflects a misconception about the production/transmission of sound. *Examples:* *The sound waves get sucked out with the air.* *There is no more air to move the bell.* *It stops ringing because it is the air that makes the ringing sound.*	
71	Refers to sound being louder, clearer (or similar) with or without further explanation. *Examples:* *It gets louder because there is no air to absorb the sound.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032160

What is the main difference between planets and moons in our solar system?

Ⓐ All planets can support life; moons cannot.

Ⓑ All planets have atmospheres; moons do not.

Ⓒ All planets orbit the Sun; all moons orbit planets.

Ⓓ All planets are larger than all moons.

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Content Domain

Earth Science

Topic Area

Earth in the Solar System and the Universe

Cognitive Domain

Knowing

Maximum Points

1

Key

C

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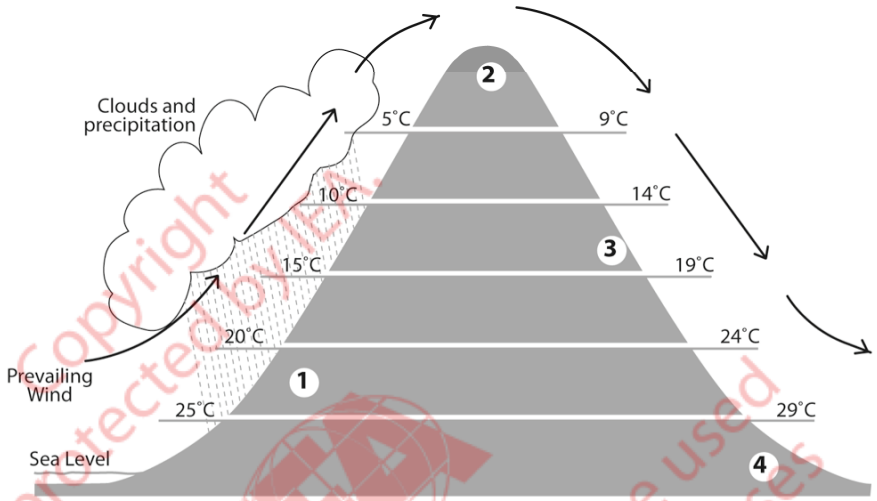

The diagram above shows the prevailing wind direction, precipitation, and average air temperatures at different elevations on both sides of a mountain. In which location are you most likely to find a jungle?

Ⓐ location 1
Ⓑ location 2
Ⓒ location 3
Ⓓ location 4

S032654

Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Reasoning

Maximum Points

1

Key

A

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S032126

State one way that a volcanic eruption can affect the environment.

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Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Knowing

Maximum Points

1

Key

See scoring guide

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Note: Credit is given for responses that state either a negative (Code 10) or positive (Code 11) effect of volcanic eruptions on the environment (plant/animal life, habitats, atmosphere, soil, water, etc.). Correct responses may be long-term or short-term effects and should include a specific statement about how the results of volcanic eruptions (lava, gases, smoke, ash, etc.) can affect the environment. Vague responses that refer only to destruction or general effects are scored as incorrect (Code 70).

Code	Response	Item: S032126
	Correct Response	
10	States a **negative** environmental effect due to volcanic eruptions such as pollution (due to release of gases, smoke, ash, etc.) or destruction of habitats or plant/animal life (due to lava flow, burning or similar). *Examples:* *Burns away essential plant life.* *Lava would ruin the ground and burn everything.* *It lets out harmful gases.* *It covers everything with ash.* *It kills everything in its path. [Assume 'in its path' means lava flow.]* *Volcanic eruptions produce ashes that will pollute the environment.* *It will release carbon dioxide into the atmosphere that might cause a greenhouse effect.* *The huge amount of black smoke will pollute the air.* *Sulfuric gases cause acid rain.*	
11	States a **positive** environmental effect such as making land fertile, creating new habitats, and allowing for different life forms. *Examples:* *It can make the land surrounding the volcano more fertile.* *It might destroy some crops, but give a better chance for a new one to come in.*	
19	Other correct	
	Incorrect Response	
70	Gives only a general statement of destruction or the nature of volcanic eruptions with inadequate description of how the environment is affected. *Examples:* *It can destroy everything.* *People can die.* *It can ruin the environment.* *It is very hot and the heat might get out and affect the environment.* *Dense ash and lava.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032510

The following waste materials are buried in a landfill.
Which will break down most quickly?

Ⓐ steel
Ⓑ plastic
Ⓒ glass
Ⓓ paper

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Content Domain

Earth Science

Topic Area

Earth's Resources, Their Use and Conservation

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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S032158

A gas is heated and its temperature increases.
What happens to the gas molecules?

Ⓐ They get bigger.
Ⓑ They move faster.
Ⓒ They move slower.
Ⓓ They increase in number.

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Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Knowing

Maximum Points

1

Key

B

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S052093

Twins are born. One is a boy and one is a girl.

Which statement is correct about their genetic makeup?

Ⓐ The boy and girl inherit genetic material from the father only.

Ⓑ The boy and girl inherit genetic material from the mother only.

Ⓒ The boy and girl inherit genetic material from both parents.

Ⓓ The boy inherits genetic material from the father only and the girl inherits it from the mother only.

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Content Domain

Biology

Topic Area

Life Cycles, Reproduction, and Heredity

Cognitive Domain

Applying

Maximum Points

1

Key

C

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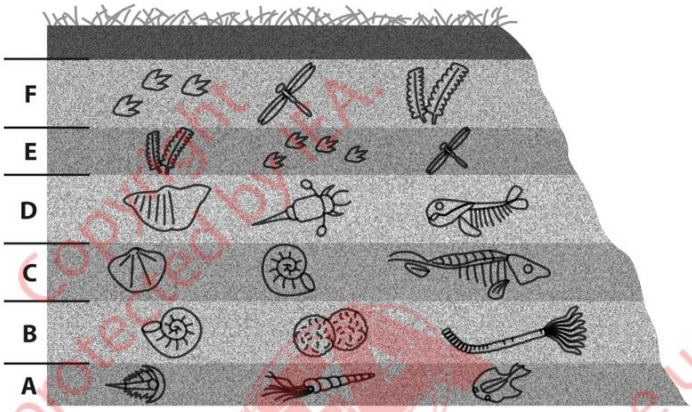
Publisher: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

The diagram below shows geological layers of rock containing fossils. Layer F is the uppermost layer, while Layer A is the deepest layer.



Which statement about the age of the fossils is most likely correct?

Ⓐ Fossils in Layer A are the oldest, because they are located in the deepest layer.

Ⓑ Fossils in Layer C are the youngest, because they look similar to existing organisms.

Ⓒ Fossils in Layer D are older than fossils in Layer A, because the fossils in Layer D are bigger.

Ⓓ Fossils in Layer E are the same age as those in Layer F because they look the same.

S052088

Content Domain

Biology

Topic Area

Diversity, Adaptation, and Natural Selection

Cognitive Domain

Applying

Maximum Points

1

Key

A

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Susie has a potted plant. She sets up an experiment that shows that water travels through a plant into the air.

Which experiment would show this?

Ⓐ Put water in a container under the pot; water will disappear from the container.

Ⓑ Cover one of the stems of the plant with a plastic bag and water the plant; drops of water will be seen in the bag.

Ⓒ Place a cut stem from the plant in a plastic bag; water will be seen in the bag.

Ⓓ Place a cut stem from the plant in a glass of colored water; the plant's leaves will change color.

S052030

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Reasoning

Maximum Points

1

Key

B

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S052080

John has diabetes.

Which of the following should he be careful about eating or drinking?

Ⓐ beef
Ⓑ eggs
Ⓒ milk
Ⓓ fruit juice

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Content Domain

Biology

Topic Area

Human Health

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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The amount of carbon dioxide in the air is increasing in a large city due to the growing number of vehicles. The mayor wants to plant more trees.

Do you agree with the mayor's suggestion?

(Check one box.)

☐ Yes

☐ No

Explain your answer.

S052091

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Reasoning

Maximum Points

1

Key

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Note: Responses that include elements of Codes 10 and 11 should be given Code 10. (*Example: Yes and No – They should plant trees to absorb carbon dioxide but they should also try to reduce the amount of carbon dioxide by walking more*).

Code	Response	Item: S052091
	Correct Response	
10	**Yes** with an explanation that trees absorb carbon dioxide (during photosynthesis). *Examples:* *Yes – When trees photosynthesize they take in carbon dioxide and give out oxygen.* *Yes – Trees take in carbon dioxide.*	
11	**No** with a valid explanation related to reducing carbon dioxide emission. *Examples:* *No – The mayor should suggest ways to cut the amount of carbon dioxide by getting people to walk or cycle.* *No – I disagree with the major, as planting more trees won't solve the problem the same way as lessening the amount of cars on the road.*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task), including the following response: • Explanation relates to oxygen only	
	Nonresponse	
99	Blank	

S052152

A car tire runs over a can and crushes it completely.

Which statement is true for the atoms in the structure of the can?

Ⓐ The atoms are broken.

Ⓑ The atoms are flattened.

Ⓒ The atoms remain the same.

Ⓓ The atoms are changed into different atoms.

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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Applying

Maximum Points

1

Key

C

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Some physical properties of five different substances (A, B, C, D, and E) are outlined in the table below. Two of the substances are metal.

	Substance A	Substance B	Substance C	Substance D	Substance E
Physical state at room temperature (20°C)	solid	solid	liquid	liquid	gas
Appearance/ color	shiny grey	white	silver	colorless	colorless
Conducts electricity	yes	no	yes	yes	no

List the two substances (A, B, C, D, or E) that are metal.

1.

2.

S052136

Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Reasoning

Maximum Points

1

Key

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Code	Response	Item: S052136
	Correct Response	
10	Lists substances A and C.	
	Incorrect Response	
70	Lists substance A with an incorrect or no other substance listed.	
71	Lists substance C with an incorrect or no other substance listed.	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task), including the following responses: 1. Shiny grey 2. Silver	
	Nonresponse	
99	Blank	

S052046

Why can a small fire be put out by placing a heavy blanket over it?

Ⓐ This lowers the temperature.

Ⓑ This makes the flames smaller.

Ⓒ This absorbs the burning substance.

Ⓓ This keeps oxygen from reaching the fire.

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Content Domain

Chemistry

Topic Area

Chemical Change

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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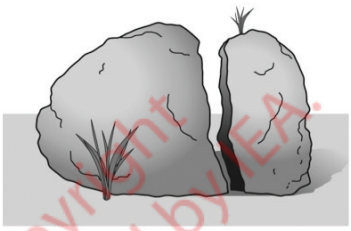
Scientists think that the rocks in the picture were once a single rock.



Which property of water had the **most** effect on splitting the rock into two pieces?

Ⓐ Water expanding when it freezes.
Ⓑ Water boiling at 100°C.
Ⓒ Water having a density less than rock.
Ⓓ Water dissolving many substances.

S052254

Content Domain

Chemistry

Topic Area

Properties of Matter

Cognitive Domain

Reasoning

Maximum Points

1

Key

A

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An object has a density of 1.1 g/cm^3.

In which liquid would this object float?

(Check one box.)

☐ Liquid X: 1.3 g/cm^3

☐ Liquid Y: 0.9 g/cm^3

Explain your answer.

S052207

Content Domain

Physics

Topic Area

Forces and Motion

Cognitive Domain

Knowing

Maximum Points

1

Key

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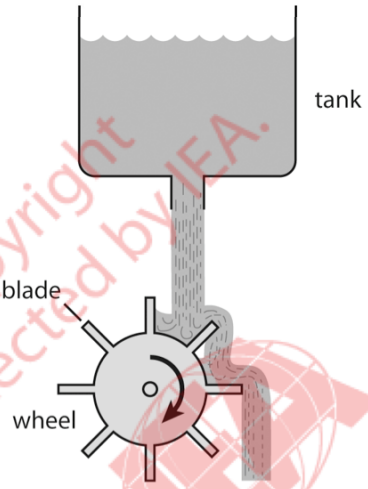
Code	Response	Item: S052207
	Correct Response	
10	**Liquid X** with an explanation that refers to the object being less dense. *Examples:* *Liquid X – The density of the object is lower than the density of liquid X, so it can float in liquid X.* *Liquid X – In order for the object to float, it must have a lower density than the liquid.* *Liquid X – Because it is less dense [assume object].*	
	Incorrect Response	
70	**Liquid X** with an explanation that refers to the object/liquid being heavier or lighter. *Example:* *Liquid X – Because the object is lighter.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

The diagram shows water flowing from a tank and rotating a wheel.



A. What kind of energy does the water have when it is in the tank?

B. What kind of energy does the water have just before it hits the wheel?

C. Write one change to the system that will make the wheel rotate faster.

S052165

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Knowing

Maximum Points

1

Key

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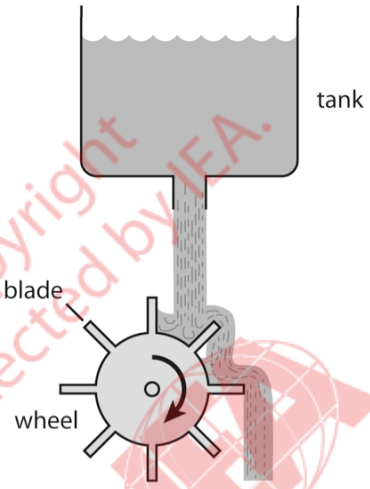
Code	Response	Item: S052165A
	Correct Response	
10	(Gravitational) potential energy or gravitational energy or stored energy	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

The diagram shows water flowing from a tank and rotating a wheel.



A. What kind of energy does the water have when it is in the tank?

B. What kind of energy does the water have just before it hits the wheel?

C. Write one change to the system that will make the wheel rotate faster.

S052165

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Knowing

Maximum Points

1

Key

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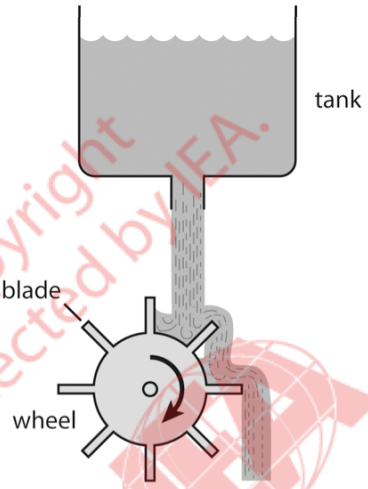
Code	Response	Item: S052165B
	Correct Response	
10	Kinetic energy (with or without (gravitational) potential energy, or gravitational energy, or stored energy)	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

The diagram shows water flowing from a tank and rotating a wheel.



A. What kind of energy does the water have when it is in the tank?

B. What kind of energy does the water have just before it hits the wheel?

C. Write one change to the system that will make the wheel rotate faster.

S052165

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Reasoning

Maximum Points

1

Key

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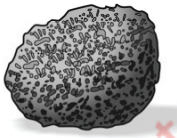
Code	Response	Item: S052165C
	Correct Response	
10	Gives a reason related to increasing the flow of water from the list of acceptable responses below. • Put more water in the tank • Use a taller water tank • Make the outlet wider/bigger • Make another outlet • Increase the distance between the wheel and the tank • Make the wheel smaller • Make the blades wider/bigger/longer • Increase the number of blades	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task), including responses that do not include how to change the system. *Examples:* *Increase the water flow.* *Increase the pressure.*	
	Nonresponse	
99	Blank	

Some volcanic rocks have many holes in them.



How were the holes made?

Ⓐ Insects dug into the rock when it was soft.
Ⓑ Gas bubbles were trapped in the rock when it cooled.
Ⓒ Rain dropped on the rock when it was soft.
Ⓓ Small stones fell out of the rock when it cooled.

S052297

Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Knowing

Maximum Points

1

Key

B

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S052032

Two continents are separated by water.

Geologists are looking for evidence that the two continents were once joined.

What fossil evidence would support this idea?

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Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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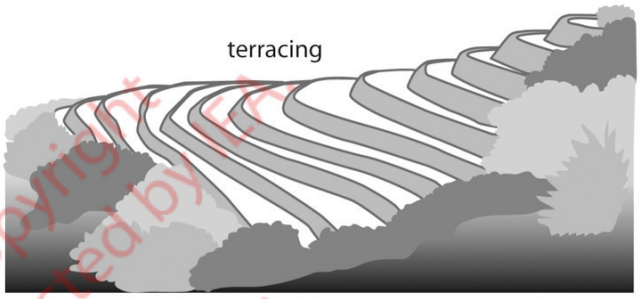
Code	Response	Item: S052032
	Correct Response	
10	Explains that fossils from identical (land) organisms (that cannot fly or swim) can be found on both continents. *Examples:* *The same species of extinct animals are found on the two continents.* *If the same fossilized animals are found on both continents.* *Same sort of fossil in both places* *Similar fossils*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

The diagram below shows a field on a slope that is being farmed using the terracing method.



Write one advantage of using the method of farming shown in the diagram.

S052106

Content Domain

Earth Science

Topic Area

Earth's Resources, Their Use and Conservation

Cognitive Domain

Applying

Maximum Points

1

Key

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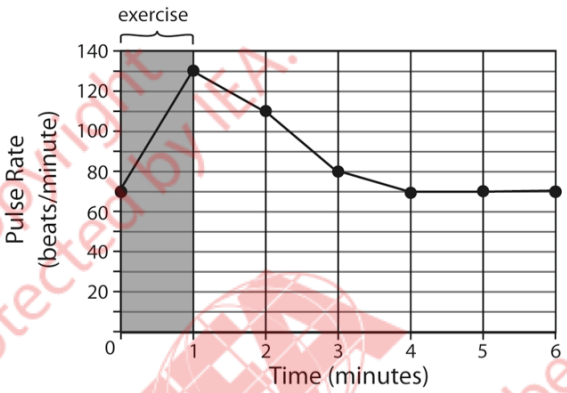
Code	Response	Item: S052106
	Correct Response	
10	Writes one advantage of using the terracing method from the list of acceptable responses below. • Allows farming to be done on a slope (utilize more land) • Run-off slowed down (prevents crops from washing away) • Prevents soil erosion (landslides, rock slides) • Able to grow different crops • Retains water so crops are healthier/need less watering *Examples:* *You can farm in steep places.* *Helps to avoid the washing away of crops on hills.* *Reduces soil erosion.* *Can grow different crops on the different levels.*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

John measures his pulse rate before he exercises. It is 70 beats per minute. He exercises for one minute and measures his pulse rate again. He then measures it every minute for several minutes. He draws a graph to show his results.



What can be concluded from his results?

Ⓐ His pulse rate increased by 50 beats per minute.

Ⓑ His pulse rate took less time to slow down than to increase.

Ⓒ His pulse rate after 4 minutes was 80 beats per minute.

Ⓓ His pulse rate returned to normal in less than 6 minutes.

S042304

Content Domain

Biology

Topic Area

Characteristics, Classification, and Life Processes of Organisms

Cognitive Domain

Reasoning

Maximum Points

1

Key

D

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S042038

Where did organisms live when they first appeared on Earth?

Ⓐ in the water
Ⓑ in the air
Ⓒ on the land
Ⓓ under the ground

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Content Domain

Biology

Topic Area

Diversity, Adaptation, and Natural Selection

Cognitive Domain

Knowing

Maximum Points

1

Key

A

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S042298

A farmer planted a field of corn. Weeds started to grow among the seedlings. Explain why it is important that he remove the weeds.

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Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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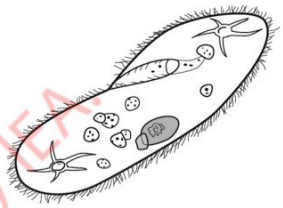
Code	Response	Item: S042298
	Correct Response	
10	Mentions competition for resources (nutrients, water, sunlight). *Examples:* *They compete with other plants for space, water and sunlight.* *The weeds will compete with the seedlings for food and water.* *The weeds would fight the corn for nutrients.*	
	Incorrect Response	
70	Refers to interfering with growth, but is not specific. *Examples:* *The weeds may interfere with the growth of the plants.* *It is important to remove the weeds because the corn won't grow as good.*	
71	Mentions competition for space and/or weeds reproducing (growing) rapidly. *Examples:* *The weed roots will take over the ground and the corn would have a hard time growing and the weeds would take up space and the crop would be cramped.* *They would grow very quickly and take over the field.* *They reproduce too rapidly.* *They overpower corn.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *Weeds attract caterpillars which will eat up the plants if not removed.* *Because some animals eat weeds and they might eat the corn too.*	
	Nonresponse	
99	Blank	

The diagram shows a single-celled organism called a *Paramecium*.



In order to survive, the *Paramecium* carries out certain life functions, such as taking in nutrients to produce energy.

State one other life function that the *Paramecium* must carry out in order to survive.

S042261

Content Domain

Biology

Topic Area

Cells and Their Functions

Cognitive Domain

Knowing

Maximum Points

1

Key

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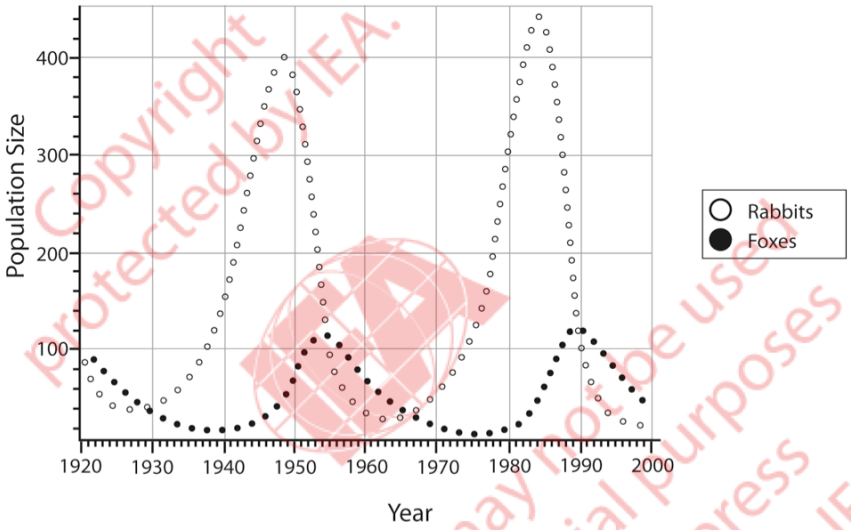
Note: Responses include one of the following life functions:
Getting rid of waste (wastes would poison the cell)
Reproduction (the species would die out otherwise)
Taking in oxygen/respire (needed to produce energy)
Responding to stimuli (moving towards food)
Digestion (breaking down food substances)

Code	Response	Item: S042261
	Correct Response	
10	States one life function as noted above. *Examples:* *It has to put out waste products.* *It reproduces by splitting itself.* *Take in oxygen.* *Respiration.* *It has to exchange gases by diffusion.* *It has to swim to find food.*	
	Incorrect Response	
70	Refers to taking in water. *Examples:* *It has to take in water as well.* *Water.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *Takes in food.* *Nutrition.*	
	Nonresponse	
99	Blank	

A population of rabbits and foxes live in a remote area. The foxes do not have any predators.
Scientists counted the number of rabbits and foxes over a long time period and plotted their results, as shown below.



A. In which year was the population of rabbits at its highest?

B. Describe how the changes in population size of rabbits and foxes are related.

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

S042051

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SOURCE: TIMSS 2011 Assessment. Copyright © 2013 International Association for the Evaluation of Educational Achievement (IEA).
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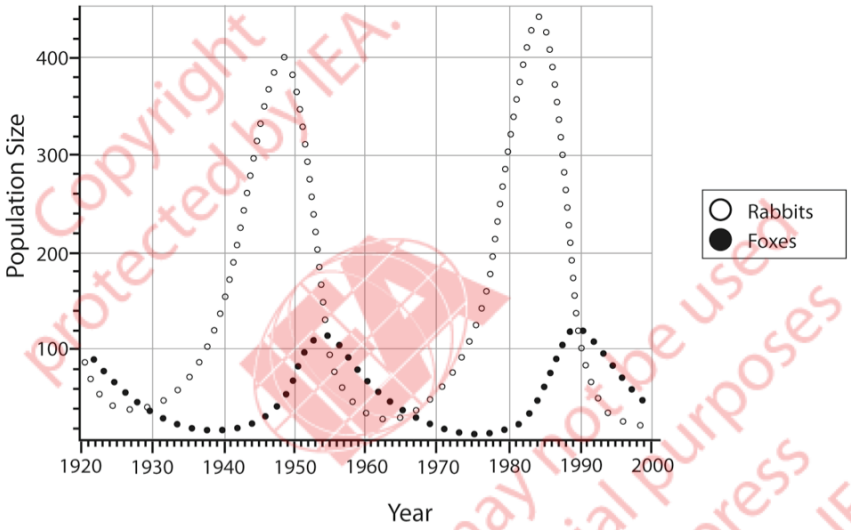
Code	Response	Item: S042051A
	Correct Response	
10	1983 - 1985	
	Incorrect Response	
70	States the year for foxes: 1988-1990	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

A population of rabbits and foxes live in a remote area. The foxes do not have any predators.
Scientists counted the number of rabbits and foxes over a long time period and plotted their results, as shown below.



A. In which year was the population of rabbits at its highest?

B. Describe how the changes in population size of rabbits and foxes are related.

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

S042051

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Code	Response	Item: S042051B
	Correct Response	
10	Describes how the changes in population are related by referring to the foxes (predators) eating the rabbits (prey). *Examples:* *As the population of rabbits increased the foxes also increased as they have more rabbits to eat.* *If the population of rabbits decreased, the foxes also decreased as they may have less rabbits to eat and soon foxes will die of hunger.*	
11	Relates the graph of the fox population to that of the rabbit population without reference to predator/prey. *Examples:* *When the rabbit population increases the fox population increases and when the rabbit population decreases the fox population decreases.* *When there are more foxes, there are less rabbits, and when there are less foxes, there are more rabbits.* *The larger the number of rabbits, the larger the number of foxes.*	
	Incorrect Response	
70	States that foxes eat rabbits without describing how the changes in population size are related. *Examples:* *Foxes eat the rabbits.*	
71	Gives a general description that relates to both going up and down without mentioning how the changes in population size are related. *Examples:* *Both rise up and down but the last raise it is higher than the rest by a little bit.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042076

Complete the table below to show the number of atoms of each element in a molecule of sulfuric acid (H_2SO_4).

Element	Number of Atoms
Hydrogen	
Sulfur	
Oxygen	

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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Knowing

Maximum Points

1

Key

See scoring guide

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<table>
<tr><th colspan="2">Code</th><th>Response</th><th>Item: S042076</th></tr>
<tr><td></td><td colspan="3">Correct Response</td></tr>
<tr><td>10</td><td colspan="3">Completes the table as shown below:

<table><tr><td>Element</td><td>Number of Atoms</td></tr><tr><td>Hydrogen</td><td>2</td></tr><tr><td>Sulfur</td><td>1</td></tr><tr><td>Oxygen</td><td>4</td></tr></table></td></tr>
<tr><td></td><td colspan="3">Incorrect Response</td></tr>
<tr><td>79</td><td colspan="3">Incorrect (including crossed out, erased, stray marks, illegible, or off task)</td></tr>
<tr><td></td><td colspan="3">Nonresponse</td></tr>
<tr><td>99</td><td colspan="3">Blank</td></tr>
</table>

S042404

Diagram 1

Diagram 2

Ice-cold water was placed in a glass pitcher on a hot day (Diagram 1). Soon afterwards, liquid appeared on the outside of the pitcher (Diagram 2).

Describe the process that caused the liquid to appear on the outside of the pitcher.

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Content Domain

Physics

Topic Area

Physical States and Changes in Matter

Cognitive Domain

Applying

Maximum Points

2

Key

See scoring guide

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Code	Response	Item: S042404
	Correct Response	
20	Describes the process of condensation by referring to water vapor (in the air) condensing on the cool outside surface of the pitcher. *Examples:* *The water droplets came from the water vapor in the air which condenses into liquid water when it touches a cool surface. The surface of the glass pitcher is cool because it loses heat to the ice cold water.* *It came from the water vapor condensing on the cool surface of a glass pitcher.*	
	Partially Correct Response	
10	Describes the process of condensation by referring to water vapor (in the air) condensing without mentioning the coolness of the pitcher. *Examples:* *The liquid came from water vapor condensing.*	
11	States condensation without referring to water vapor. *Examples:* *Condensation.* *It condensed from the sky.*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *Liquid came from the sky.* *It came from the clouds.*	
	Nonresponse	
99	Blank	

S042306

Which of the following defines a compound?

Ⓐ different substances mixed together
Ⓑ atoms and molecules mixed together
Ⓒ atoms of different elements combined together
Ⓓ atoms of the same element combined together

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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Knowing

Maximum Points

1

Key

C

SOURCE: TIMSS 2011 Assessment. Copyright © 2013 International Association for the Evaluation of Educational Achievement (IEA).
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Ray has two metal bars. He knows Metal bar 1 is a magnet.

How could he use Metal bar 1 to find out if Metal bar 2 is a magnet?

What would he observe if Metal bar 2 is a magnet?

S042403

Content Domain

Physics

Topic Area

Electricity and Magnetism

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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Code	Response	Item: S042403
	Correct Response	
10	Refers to metals repelling each other. May or may not include attraction. *Examples:* *Put one end of Metal 1 to both ends of Metal 2; If the metals repel, then Metal 2 is a magnet.* *When either one of the ends goes near metal 2 it repels.* *If metal 2 is a magnet it will repel against metal 1.* *Put metal 1 next to metal 2. If metal 2 is a magnet, it will repel or attract metal 1.*	
	Incorrect Response	
70	Refers to attraction only. *Examples:* *Touch the ends of Metal 1 to the ends of Metal 2; If the metals attract, then Metal 2 is a magnet.* *Put them together; They would stick.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042272

What happens to the molecules of a liquid when the liquid cools?

Ⓐ They slow down.
Ⓑ They speed up.
Ⓒ They decrease in number.
Ⓓ They decrease in size.

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Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Knowing

Maximum Points

1

Key

A

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S042100

Ahmet put some powder into a test tube. He then added liquid to the powder and shook the test tube. A chemical reaction took place.

Describe two things he might observe as the chemical reaction took place.

1.

2.

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Content Domain

Chemistry

Topic Area

Chemical Change

Cognitive Domain

Knowing

Maximum Points

2

Key

See scoring guide

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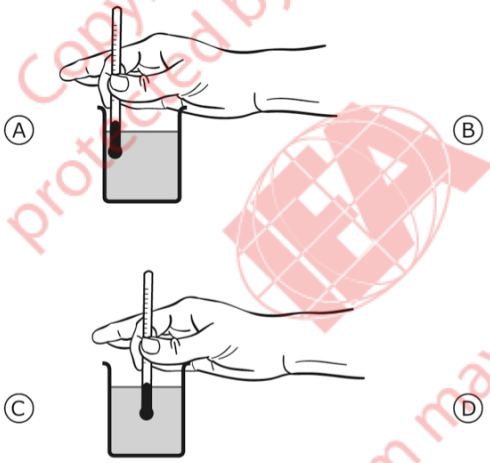
Note: The following observations may take place during a chemical reaction:
Appearance of a new color (color change)
Seeing gas production (bubbling, foaming)
Hearing a noise (fizzing)
Smelling a gas
Changing temperature (increase or decrease)
A precipitate forming
Light being emitted
An explosion taking place

Code	Response	Item: S042100
	Correct Response	
20	Describes **two** different observations as listed in the note above. *Examples:* *A new colored compound might form. The surface will begin to bubble.* *The temperature may change. Gas could be produced while the reaction is taking place.* *Heat may be produced. Crystals form.* *It gives off light. An explosion.*	
	Partially Correct Response	
10	Describes **one** observation as listed in the note above. *Examples:* *The mixture will bubble. The mixture will foam.*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *Powder dissolving.*	
	Nonresponse	
99	Blank	

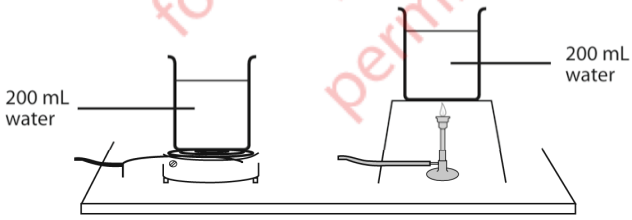
Two kinds of heat sources are usually available in the science lab; an electric hot plate and a Bunsen burner. Jack planned an investigation to test which of these sources heats water faster.

He poured 200 mL of water into each of two identical beakers and recorded the initial temperature of the water in each beaker.

A. Where should Jack place the thermometer to accurately take his readings during his investigation?



Jack then placed one beaker on a hot plate and the other over a Bunsen burner, as shown below.



Hot Plate Setup **Bunsen Burner Setup**

He recorded the temperature of the water in each set up every two minutes for ten minutes.

S042238_1

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Knowing

Maximum Points

1

Key

C

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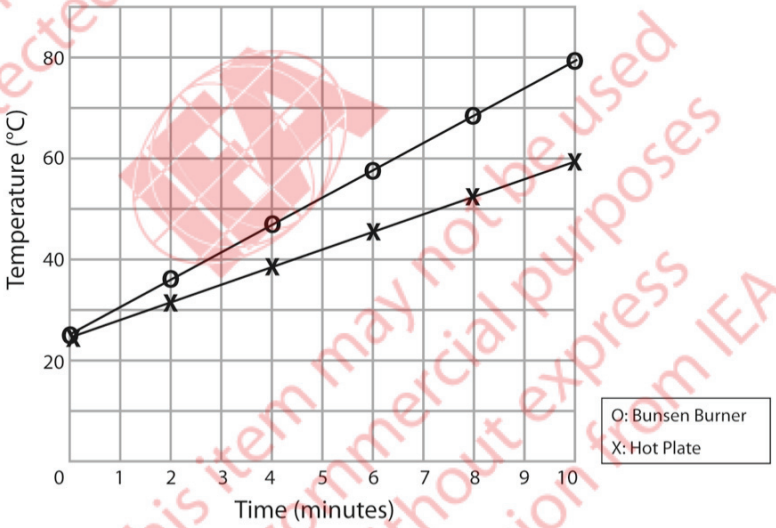
B. List one variable that Jack controlled in his investigation.

C. Jack used his results to draw a graph as shown below.



Use the information in the graph to explain which heat source heated the water faster.

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S042238_2

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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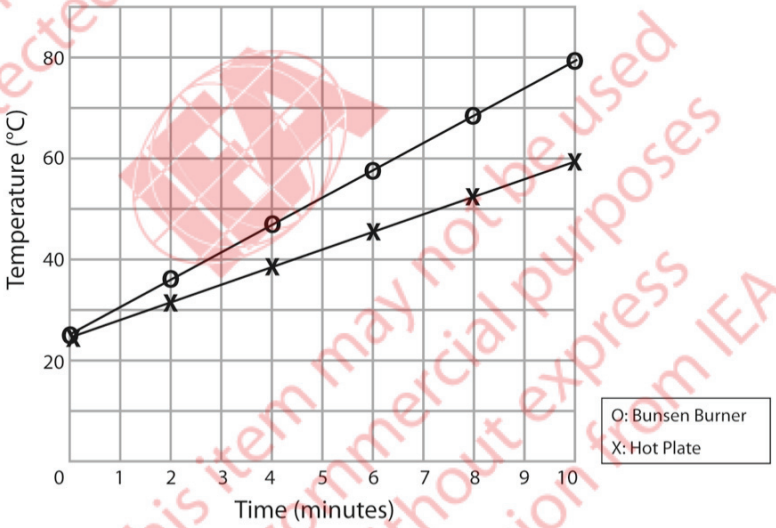
Note: The variables controlled are as follows:
The beakers (same, same shape, same size, same materials)
The water (same volume, from the same place)
The thermometer (same type, same position for taking readings)
Location of the experiment (same place, same room)

Code	Response	Item: S042238B
	Correct Response	
10	Lists one variable as shown in the note above.	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *The initial temperature.* *Checking the temperature.* *Timing.*	
	Nonresponse	
99	Blank	

B. List one variable that Jack controlled in his investigation.

C. Jack used his results to draw a graph as shown below.



Use the information in the graph to explain which heat source heated the water faster.

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Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

S042238_2

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Code	Response	Item: S042238C
	Correct Response	
10	States that the Bunsen Burner heated the water faster than the hot plate. *Examples:* *The bunsen burner heated faster because the temperature of the water after 10 minutes was higher than the temperature of the water being heated by the hot plate.* *The bunsen burner heats up water at a faster rate than the hot plate.* *The bunsen burner was a lot faster at heating up the water than the hot plate was.* *The bunsen burner.*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042141

Where are active volcanoes most likely to be found?

Ⓐ where rivers form
Ⓑ where tectonic plates meet
Ⓒ where oceans are deepest
Ⓓ where land and water meet

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Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Knowing

Maximum Points

1

Key

B

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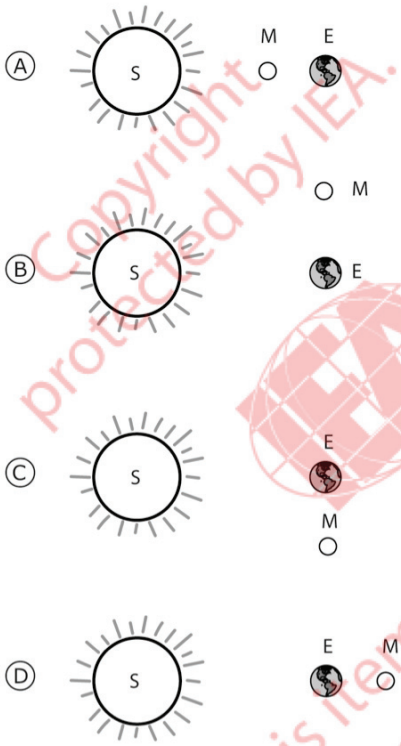
Which diagram shows the position of the sun(S), moon(M), and Earth(E) during an eclipse of the moon? (Not drawn to scale)



S042215

Content Domain

Earth Science

Topic Area

Earth in the Solar System and the Universe

Cognitive Domain

Applying

Maximum Points

1

Key

D

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S032542

The following table shows the classification of some animals into two categories.

Category 1	Category 2
rabbit	frog
giraffe	spider
elephant	lion

Which of the following was used to classify these animals?

Ⓐ organs used in breathing
Ⓑ food source
Ⓒ method of reproduction
Ⓓ pattern of movement

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Content Domain

Biology

Topic Area

Characteristics, Classification, and Life Processes of Organisms

Cognitive Domain

Applying

Maximum Points

1

Key

B

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S032645

Which of the following statements is true about organisms that are producers?

Ⓐ They use energy from the sun to make food.

Ⓑ They absorb energy from a host animal.

Ⓒ They get energy from eating living plants.

Ⓓ They get energy by breaking down dead plants and animals.

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Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Knowing

Maximum Points

1

Key

A

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S032530

Many seeds can germinate in the light or in the dark.
State two conditions necessary for germination.

1.

2.

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Content Domain

Biology

Topic Area

Life Cycles, Reproduction, and Heredity

Cognitive Domain

Knowing

Maximum Points

2

Key

See scoring guide

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Note: Each of the two responses is coded separately. The same correct diagnostic code (10, 11, 12) may only be used once. If the two responses are essentially the same, the second response should be coded as 79. For example, if a response mentions both oxygen and air, the first should be given a Code 12, and the second a Code 79. If only one response is given, the second should be coded as 99. Other correct country-specific conditions are possible such as wild fires, dry conditions, etc. These should be given Code 19.

Two correct responses will be given 2 score points and one correct response will be given 1 score point.

Code	Response	Item: S032530A,B
	Correct Response	
10	Water (moisture, rain) or similar. *Examples:* *Humid conditions* *Dampness* *Wet weather* *Moist soil*	
11	Suitable temperature (heat, warmth) or similar. *Examples:* *Acceptable temperature for seeds to survive* *Heat about 27° C* *Hot weather* *Warmth from the sun*	
12	Oxygen (air). *Examples:* *They need oxygen.* *There has to be air.*	
19	Other correct	
	Incorrect Response	
70	Soil or similar. *Examples:* *Fertile soil.* *Nutrients in soil.* *Many seeds need earth.*	
71	Sun, sunlight, or light (no explicit mention of heat, warmth or similar). *Examples:* *Sunlight* *Sun*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032007

The uterus (womb) is part of the reproductive system in mammals.
Name one function of the uterus.

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Content Domain

Biology

Topic Area

Characteristics, Classification, and Life Processes of Organisms

Cognitive Domain

Knowing

Maximum Points

1

Key

See scoring guide

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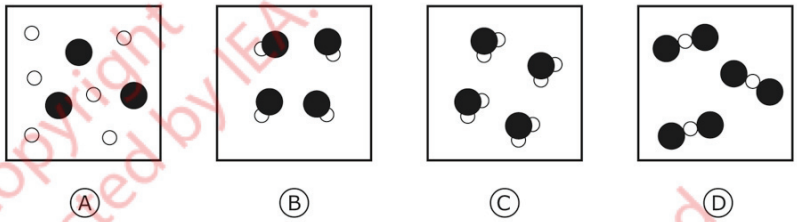
Code	Response	Item: S032007
	Correct Response	
10	States that the embryo (fetus, baby, fertilized egg, etc.) develops in the uterus (or similar). *Examples:* *The uterus protects the baby while it grows.* *The baby develops from the egg inside the uterus.* *It supplies food and oxygen to the embryo (fetus, baby).* *To carry the infant.* *It holds the baby.* *The baby lives in it for 9 months.* *The fertilized egg lodges in the wall of the uterus.*	
19	Other correct *Examples:* *The muscles in the uterus contract and push the baby out.*	
	Incorrect Response	
70	States a reproductive organ or function but with an incorrect/inadequate connection to the function of the uterus. *Examples:* *It's where the eggs are stored.* *To give birth.* *To produce eggs.* *It's connected to the ovaries.* *To get pregnant.* *Where the eggs travel.* *Sperm flows through.*	
71	Confuses the reproductive and urinary systems. *Examples:* *To urinate.* *To eliminate water out of the body.* *Removing wastes.* *It's connected to the bladder.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible or off task)	
	Nonresponse	
99	Blank	

S032502

In the diagrams below, hydrogen atoms are represented by white circles, and oxygen atoms are represented by black circles.

Which of the diagrams best represents water?



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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Applying

Maximum Points

1

Key

C

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S032679

Write down one thing you might observe that shows that energy has been released during a chemical reaction.

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Content Domain

Chemistry

Topic Area

Chemical Change

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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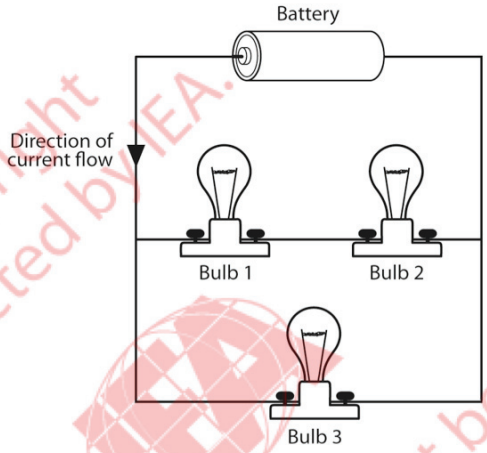
Note: To receive credit, responses must refer to direct evidence of energy given off (heat or temperature increase, light, sound, etc.). Responses that refer only to observations of steam, smoke, bubbling, gas production, or other changes in materials that do not necessarily indicate an exothermic reaction are scored as incorrect. Priority should be given to Code 10. If heat or temperature increase is mentioned, then Code 10 should be given even if other correct codes apply. Otherwise, if more than one response is given, the code corresponding to the first correct response should be given.

Code	Response	Item: S032679
	Correct Response	
10	Refers to heat or temperature increase (or similar). *Examples:* *Heat has been given off.* *The temperature goes up.* *The chemicals feel warm, indicating heat energy has been released.*	
11	Refers to explosion or hearing sound (or similar). *Examples:* *It could explode.* *There would be a "pop" sound.*	
12	Refers to light production or seeing flames (or similar). *Examples:* *You see light and hear sound.* *It glows.* *You will see the flames.*	
19	Other correct *Examples:* *If the chemical reaction causes something to move, like with a rocket blast.*	
	Incorrect Response	
70	Refers only to steam, smoke, bubbling, gas production (or similar). [No explicit reference to heat.] *Examples:* *The substance is bubbling.* *Steam is released.* *Smoke rises from the substance.* *A gas is produced.*	
71	Refers only to other evidence of change in materials that does not necessarily indicate that energy has been released (e.g., smell, color change). *Examples:* *The color changes.* *The solution becomes cloudy.* *There will be extra chemicals in the solution.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *Sweating; a change in state.*	
	Nonresponse	
99	Blank	

Three identical light bulbs are connected to a battery as shown in the diagram. The arrow indicates the direction of the current flow.



Which statement is true?

(A) The current in Bulb 1 is greater than the current in Bulb 2.
(B) The current in Bulb 1 is greater than the current in Bulb 3.
(C) The current in Bulb 2 is the same as the current in Bulb 3.
(D) The current in Bulb 2 is the same as the current in Bulb 1.

S032184

Content Domain

Physics

Topic Area

Electricity and Magnetism

Cognitive Domain

Applying

Maximum Points

1

Key

D

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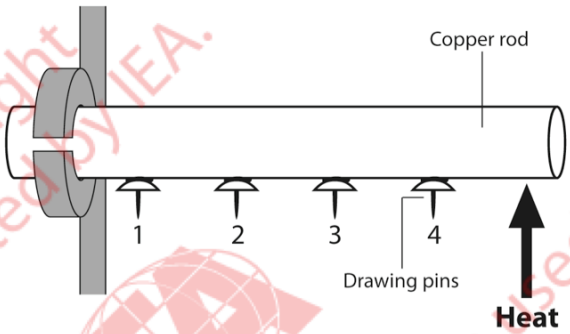
A student attaches four drawing pins to a copper rod using candle wax as shown in the diagram. The rod is then heated continuously at one end and the pins fall off in the order 4, 3, 2, 1.



By which process does heat reach the pins?

Ⓐ expansion
Ⓑ radiation
Ⓒ conduction
Ⓓ convection

S032394

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Applying

Maximum Points

1

Key

C

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S032151

Which of the following is the major cause of tides?

Ⓐ heating of the oceans by the Sun
Ⓑ gravitational pull of the Moon
Ⓒ earthquakes on the ocean floor
Ⓓ changes in wind direction

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Content Domain

Earth Science

Topic Area

Earth in the Solar System and the Universe

Cognitive Domain

Knowing

Maximum Points

1

Key

B

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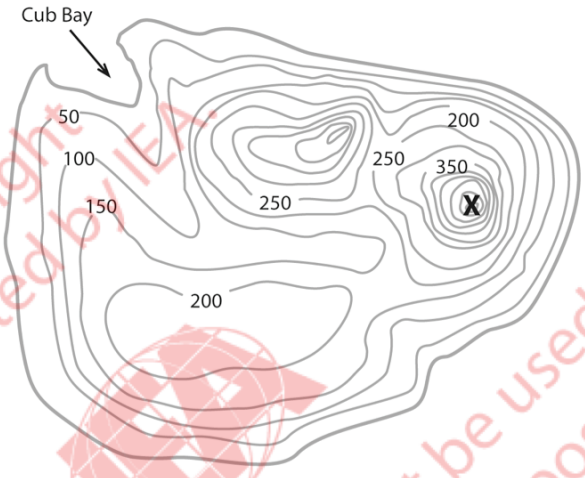
Tiger Island



The diagram above shows a topographic map of Tiger Island. The lines on the map are contour lines that connect points at the same elevation. The elevations shown are in meters.

A. What geographical feature is found at point **X**? _____

B. Think about the source of rivers and how they flow. Now draw the path of a river between point **X** and Cub Bay. Use an arrow to indicate on the map which direction the river will flow.

S032651

Content Domain

Earth Science

Topic Area

Earth's Structure and Physical Features

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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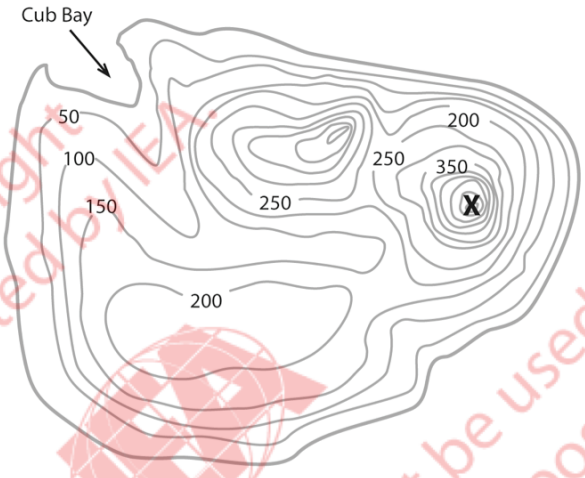
Code	Response	Item: S032651A
	Correct Response	
10	Identifies X as a mountain, hill, peak, summit, highest point, volcano, or similar.	
	Incorrect Response	
70	Identifies X as a crater, valley, hole, or similar (misinterpretation that contour lines indicate decreasing elevation).	
71	Identifies X as a water feature. *Examples:* *Pond, lake, whirlpool, waterfall, river, tidal wave, etc.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *An island.*	
	Nonresponse	
99	Blank	

Tiger Island



The diagram above shows a topographic map of Tiger Island. The lines on the map are contour lines that connect points at the same elevation. The elevations shown are in meters.

A. What geographical feature is found at point **X**? _____

B. Think about the source of rivers and how they flow. Now draw the path of a river between point **X** and Cub Bay. Use an arrow to indicate on the map which direction the river will flow.

S032651

Content Domain

Earth Science

Topic Area

Earth's Structure and Physical Features

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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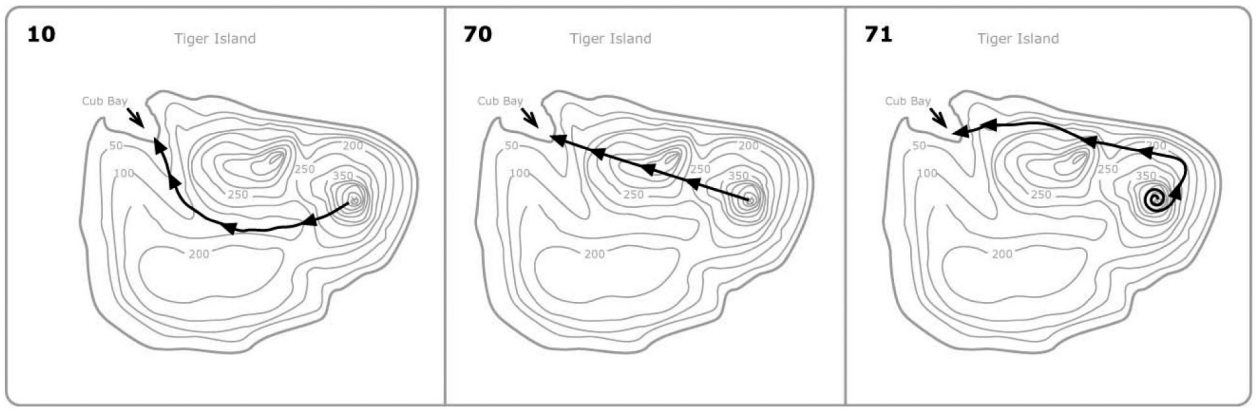
Note: For credit, the path shown must clearly go from point X downhill to Cub Bay with arrow(s) indicating the river flowing from mountain to sea. The exact path may vary somewhat, but must satisfy the conditions described in Code 10 for credit. Credit is also given for correct paths without arrows or with arrows in the opposite direction (demonstrates some knowledge of rivers flowing downhill and contour lines but unclear about the use of directional arrows). Due to the imprecision of hand drawings, some leniency should be given when deciding if the path is going downhill at all points. However, a path that CLEARLY crosses higher contour lines should be scored as incorrect.

Code	Response	Item: S032651B
	Correct Response	
10	Draws a correct path WITH arrow(s) indicating correct direction (see diagram below). [Path runs from point X downhill to Cub Bay and between the smaller hill(s). Includes arrow(s) that indicates direction of flow from mountain to the sea.]	
11	Draws a correct path (as in Code 10) but OPPOSITE direction of arrow is shown (from sea to mountain).	
12	Draws a correct path (as in Code 10) but NO arrow is shown.	
19	Other correct	
	Incorrect Response	
70	Draws a direct path that goes over the next smaller hill with or without arrow(s) (see diagram below).	
71	Draws a path that circles around hill(s) by following contour lines with or without arrow(s) (see diagram below).	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	



[Example responses provided on the following pages.]

There are more than 6 billion people in the world who share the world's natural resources. Look at the table below. It shows some information for two fictitious countries (1 and 2).

	Country 1	Country 2
Population (millions)	200	500
Annual birth rate (births per 1000 people)	10	40
Annual death rate (deaths per 1000 people)	10	10
Area in square kilometers	2 000 000	2 000 000
Grain production (percentage of world total)	40%	20%
Oil consumption (percentage of world total)	20%	5%

A. Based on the information given in the table, predict how the population of each country will change over the next ten years. (Check one box in each row.)

	Population Will Increase	Population Will Decrease	Population Will Stay the Same
Country 1	☐	☐	☐
Country 2	☐	☐	☐

B. Predict how the population of the two countries will affect each of the following environmental factors over the next ten years.

Land Use:

Pollution:

S032665

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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Code	Response	Item: S032665A
	Correct Response	
10	Country 1: Population will stay the same. Country 2: Population will increase.	
	Incorrect Response	
70	Country 1 correct; Country 2 incorrect	
71	Country 2 correct; Country 1 incorrect	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

There are more than 6 billion people in the world who share the world's natural resources. Look at the table below. It shows some information for two fictitious countries (1 and 2).

	Country 1	Country 2
Population (millions)	200	500
Annual birth rate (births per 1000 people)	10	40
Annual death rate (deaths per 1000 people)	10	10
Area in square kilometers	2 000 000	2 000 000
Grain production (percentage of world total)	40%	20%
Oil consumption (percentage of world total)	20%	5%

A. Based on the information given in the table, predict how the population of each country will change over the next ten years. (Check one box in each row.)

	Population Will Increase	Population Will Decrease	Population Will Stay the Same
Country 1	☐	☐	☐
Country 2	☐	☐	☐

B. Predict how the population of the two countries will affect each of the following environmental factors over the next ten years.

Land Use:

Pollution:

S032665

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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Note: For credit, responses must make a prediction about land use that is explicitly connected either to predicted population changes (Code 10 or 11) or to data in the table about the current population (Code 12). Other correct responses related to population change are possible based on incorrect population predictions in Part A; these should be given Code 19. Responses that are inconsistent with the population predictions in Part A should be given Code 79.

Code	Response	Item: S032665B LAND USE
	Correct Response	
10	Predicts that land use in Country 2 is likely to increase (due to the increased population). *Examples:* *Country 1 will not be affected so much but country 2 will need land for more people.* *Country 2 will need more land than country 1.* **Note:** Response to Part A must indicate that the population in Country 2 will increase (Code 10 or 71). May also state that land use stays the same in Country 1, but it is not required for credit.	
11	Predicts that land use will increase with population. [Does not explicitly refer to Country 1 or Country 2.] *Examples:* *If there are more people born, they will need more land for food.*	
12	Makes a prediction about land use based on the current population that is supported by data in the table. *Examples:* *Country 1 has higher grain production, so it uses more land than Country 2.*	
19	Other correct	
	Incorrect Response	
70	Makes a statement about land use that is NOT explicitly connected to either population prediction or data in the table. *Examples:* *Land use will increase.* *Country 1 uses more land.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

There are more than 6 billion people in the world who share the world's natural resources. Look at the table below. It shows some information for two fictitious countries (1 and 2).

	Country 1	Country 2
Population (millions)	200	500
Annual birth rate (births per 1000 people)	10	40
Annual death rate (deaths per 1000 people)	10	10
Area in square kilometers	2 000 000	2 000 000
Grain production (percentage of world total)	40%	20%
Oil consumption (percentage of world total)	20%	5%

A. Based on the information given in the table, predict how the population of each country will change over the next ten years. (Check one box in each row.)

	Population Will Increase	Population Will Decrease	Population Will Stay the Same
Country 1	☐	☐	☐
Country 2	☐	☐	☐

B. Predict how the population of the two countries will affect each of the following environmental factors over the next ten years.

Land Use:

Pollution:

S032665

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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Note: For credit, responses must make a prediction about pollution that is explicitly connected either to predicted population changes (Code 10 or 11) or to data in the table about the current population (Code 12). Other correct responses related to population change are possible based on incorrect population predictions in Part A; these should be given Code 19. Responses that are inconsistent with the population predictions in Part A should be given Code 79.

Code	Response	Item: S032665C POLLUTION
	Correct Response	
10	Predicts that pollution in Country 2 may increase (due to factors related to the growing population). *Examples:* *There will be more pollution in Country 2 as the population increases.* **Note:** Response to Part A must indicate that the population in Country 2 will increase (Code 10 or 71). May also state that pollution will stay the same in Country 1, but it is not required for credit.	
11	Predicts that pollution will increase with population. [Does not explicitly refer to Country 1 or Country 2.] *Examples:* *Many more people means more pollution.*	
12	Makes a prediction about pollution based on the current population that is supported by data in the table. *Examples:* *Country 1 will pollute more because it consumes more oil than Country 2.*	
19	Other correct	
	Incorrect Response	
70	Makes a statement about pollution that is NOT explicitly connected to either population prediction or data in the table. *Examples:* *Pollution will increase.* *Country 1 has more pollution.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042073

What is the chemical formula for carbon dioxide?

Ⓐ CO
Ⓑ CO_2
Ⓒ C
Ⓓ O_2

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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Knowing

Maximum Points

1

Key

B

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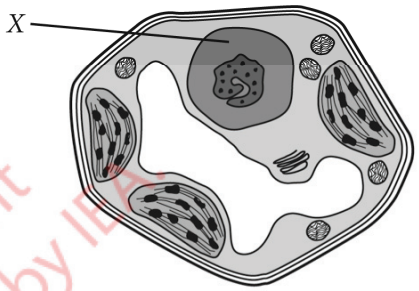

The diagram shows a plant cell.

What is the function of the part of the cell labeled *X*?

(A) It stores water.
(B) It makes food.
(C) It absorbs energy.
(D) It controls activities.

S042017

Content Domain

Biology

Topic Area

Cells and Their Functions

Cognitive Domain

Applying

Maximum Points

1

Key

D

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S042007

Which organ in a frog has a function similar to the function of lungs in a bird?

Ⓐ kidney
Ⓑ skin
Ⓒ liver
Ⓓ heart

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Content Domain

Biology

Topic Area

Characteristics, Classification, and Life Processes of Organisms

Cognitive Domain

Applying

Maximum Points

1

Key

B

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S042024

Which equation summarizes the process of respiration?

Ⓐ water + carbon dioxide + energy → sugar + oxygen

Ⓑ oxygen + sugar → carbon dioxide + water + energy

Ⓒ carbon dioxide + oxygen + water → sugar + energy

Ⓓ sugar + carbon dioxide + energy → oxygen + water

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Content Domain

Biology

Topic Area

Cells and Their Functions

Cognitive Domain

Knowing

Maximum Points

1

Key

B

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S042095

Robert put two drops of an indicator into vinegar, and the color turned red. He then added drops of ammonia solution until the color disappeared.

What process occurred?

Ⓐ rusting
Ⓑ melting
Ⓒ evaporation
Ⓓ neutralization

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Content Domain

Chemistry

Topic Area

Properties of Matter

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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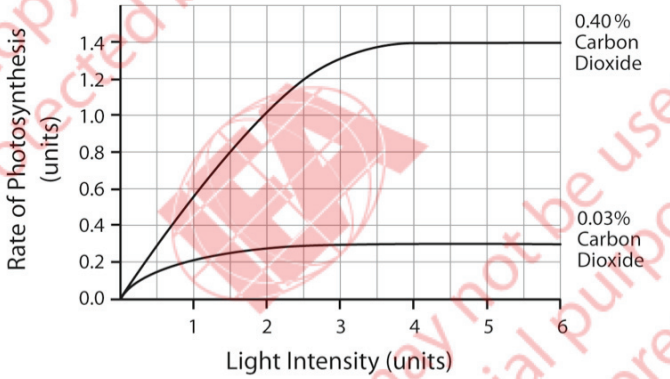
Andrea is investigating the effects of light intensity and carbon dioxide concentration on the rate of photosynthesis.

She measured the rate of photosynthesis at different light intensities for two identical plants. The plants were placed in closed containers. One container had an initial carbon dioxide concentration of 0.40%. The other container had an initial carbon dioxide concentration of 0.03%.

She plotted her results as shown below.



Look at the graph.

Does an increase in carbon dioxide concentration affect the rate of photosynthesis?

(Check one box.)

☐ Yes

☐ No

Explain your answer.

S042022

Content Domain

Biology

Topic Area

Cells and Their Functions

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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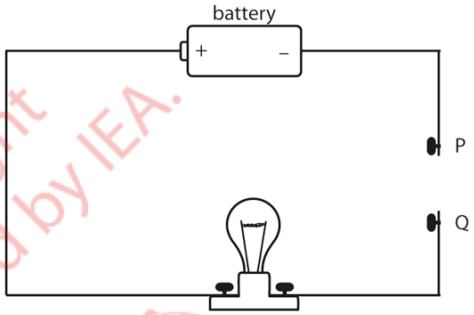
Code	Response	Item: S042022
	Correct Response	
10	**Yes** with an explanation that refers to carbon dioxide being required for (needed for, used during) photosynthesis. The explanation may or may not include a specific reference to the graph. *Examples:* *Carbon dioxide is required for photosynthesis. The higher the concentration of carbon dioxide the faster the rate of photosynthesis.* *For photosynthesis to take place it needs carbon dioxide.* *Yes, at light intensity 3, the rate of photosynthesis is 1.2 at 0.40% and 0.3 at 0.03%. This is because for photosynthesis to take place it needs carbon dioxide.* *Plants use carbon dioxide and sunlight to help photosynthesis, and so more carbon dioxide will affect the rate of growth as well as photosynthesis.*	
11	**Yes** with an explanation that refers only to the graph (either explicitly or implicitly). *Examples:* *One with 0.03% carbon dioxide is lower than the one with 0.4% carbon dioxide.* *Yes, at light intensity 3, the rate of photosynthesis is 1.2 at 0.40% and 0.3 at 0.03%.* *The rate of photosynthesis increased when the carbon dioxide concentration increased.* *Yes, the plant does photosynthesize faster.*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

Rods made of different materials are connected between points P and Q in the circuit diagram shown below.



Which rod would cause the bulb to light?

(A) copper rod
(B) wood rod
(C) glass rod
(D) plastic rod

S042063

Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Applying

Maximum Points

1

Key

A

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S042197

A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips.

How is the strength of a magnet defined in the investigation?

Ⓐ by the mass of the magnet lifting the metal paper clips
Ⓑ by the size of the magnet lifting the metal paper clips
Ⓒ by the number of metal paper clips lifted by the magnet
Ⓓ by the time the metal paper clips stay on the magnet

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Content Domain

Physics

Topic Area

Electricity and Magnetism

Cognitive Domain

Reasoning

Maximum Points

1

Key

C

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Kayra and Emre are studying plants. They have learned that characteristics such as the height of plants and the color of fruit are inherited.

They are looking at some green and red peppers.

green peppers red peppers

Kayra thinks they are different kinds of peppers, because they are different colors.

Emre thinks that they are the same type of pepper, and red peppers are red because they have been left on the plant longer and have ripened.

Describe how you could set up an investigation to decide whether Kayra or Emre is correct.

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Content Domain

Biology

Topic Area

Life Cycles, Reproduction, and Heredity

Cognitive Domain

Reasoning

Maximum Points

2

Key

See scoring guide

S042297

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Code	Response	Item: S042297
	Correct Response	
20	Refers to either i) planting (seeds from) green and red peppers AND observing the color of the fruit OR ii) planting (seeds from) green peppers AND observing if the fruit turns red. *Examples:* *I would take one seed from each of the peppers and plant them under the same condition and at the same time. Observe them at the same time after the peppers start to grow. If the red peppers become red and the green peppers did not this would show that the red and green peppers are a different kind.* *Grow plants from the seeds of the red pepper and green pepper. Wait to see what color the peppers are.* *Plant the seeds of both green and red peppers. Pollinate. Wait for the peppers to fruit.* *Plant a green pepper. When the plant grows and bears fruit leave the fruit on the plant and see if they turn red.*	
29	Other fully correct	
	Partially Correct Response	
10	Refers to ONLY planting (seeds from) green/red peppers. *Examples:* *You could grow seeds from each pepper.* *Grow them both together and at the same time.*	
19	Other correct	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042305

The table below shows some elements, compounds, and mixtures.

Classify them by putting an X in the appropriate column beside each one.

	Element	Compound	Mixture
Air			
Sugar			
Salt			
Gold			
Sea water			
Helium			

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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Applying

Maximum Points

2

Key

See scoring guide

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Code	Response	Item: S042305
	Correct Response	
20	Classifies all **6** correctly.	

	Element	Compound	Mixture
Air			**X**
Sugar		**X**	
Salt		**X**	
Gold	**X**		
Sea water			**X**
Helium	**X**		

	Partially Correct Response	
10	Classifies **4** or **5** correctly.	
	Incorrect Response	
70	Classifies **2** or **3** correctly.	
71	Classifies **1** correctly.	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042112

During which chemical process is energy absorbed?

Ⓐ iron nails rusting
Ⓑ candles burning
Ⓒ vegetables rotting
Ⓓ plants photosynthesizing

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Content Domain

Chemistry

Topic Area

Chemical Change

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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S042173

As a liquid changes into a gas, which characteristics or properties change and which stay the same?

In each row of the table below, put an X in the appropriate column.

	Changes	Stays the Same
Density		
Mass		
Volume		
Size of molecules		
Speed of molecules		

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Content Domain

Physics

Topic Area

Physical States and Changes in Matter

Cognitive Domain

Applying

Maximum Points

2

Key

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Note: Each row is scored separately. The score for density is recorded in the first set of scoring bubbles; the score for mass is recorded in the second set of scoring bubbles; etc.

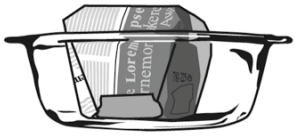
Four or five rows correct will be given 2 score points, two or three rows correct will be given 1 score point, and one or no rows correct will be given 0 score points.

<table>
<tr><th colspan="2">Code</th><th>Response</th><th>Item: S042173A,B,C,D,E</th></tr>
<tr><td></td><td colspan="3">Correct Response</td></tr>
<tr><td>10</td><td colspan="3">Places the X's correctly as shown below:

<table>
<tr><th></th><th>Changes</th><th>Stays the Same</th></tr>
<tr><td>Density</td><td>X</td><td></td></tr>
<tr><td>Mass</td><td></td><td>X</td></tr>
<tr><td>Volume</td><td>X</td><td></td></tr>
<tr><td>Size of Molecules</td><td></td><td>X</td></tr>
<tr><td>Speed of Molecules</td><td>X</td><td></td></tr>
</table>
</td></tr>
<tr><td></td><td colspan="3">Incorrect Response</td></tr>
<tr><td>79</td><td colspan="3">Incorrect (including crossed out, erased, stray marks, illegible, or off task)</td></tr>
<tr><td></td><td colspan="3">Nonresponse</td></tr>
<tr><td>99</td><td colspan="3">Blank</td></tr>
</table>

The pictures below show two ice blocks. Block 2 is wrapped in newspaper.

Ice Block 1



Ice Block 2 wrapped in newspaper

Which ice block will melt first?

(Check one box.)

- ☐ Block 1
- ☐ Block 2

Explain your answer.

S042407

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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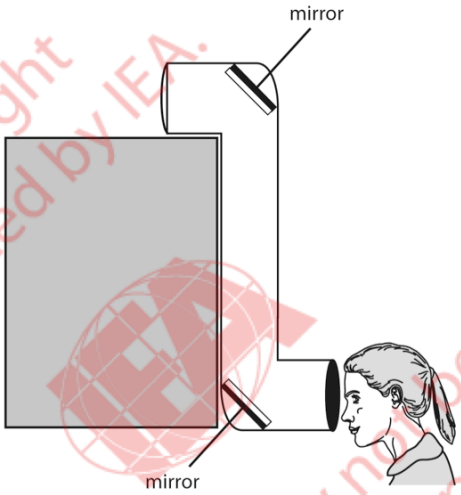
Code	Response	Item: S042407
	Correct Response	
10	**Block 1** with a explanation referring to heat OR surrounding air (hot air, sun) reaching ice block 1 more easily than ice block 2. *Examples:* *Block 1 gains heat from the surrounding air. Block 2 does not gain much heat as it is wrapped in newspaper.* *The newspaper helps to block some of the heat.* *The surrounding air can reach it more easily than ice block 2 which is covered with newspaper.* *The ice in block 2 is protected from the air, while the ice in block 1 is exposed to open air.* *It is more exposed to hot air.*	
	Incorrect Response	
70	**Block 2** with an explanation referring explicitly or implicitly to the newspaper making the ice block warmer. *Examples:* *The newspaper acts as a blanket and warms the ice.* *Because the newspaper keeps it warm.* *Because it is hotter.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task) *Examples:* *Block 1 – the paper kept the cold in.*	
	Nonresponse	
99	Blank	

S042278

The diagram below shows a periscope. Mary is using it to look over a wall.

Draw the path the light ray would take through the periscope. Show the direction of the light ray with arrows.



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Content Domain

Physics

Topic Area

Light and Sound

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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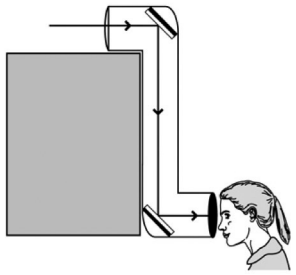
Note: i) If more than one ray is drawn they should be approximately parallel.
ii) If the diagram is redrawn by the student code as for the given diagram.

Code	Response	Item: S042278
	Correct Response	
10	Draws a correct path of the light ray with arrows showing the direction as shown below.	
		
	Incorrect Response	
70	Draws a correct path of the light ray, but arrows are missing.	
71	Draws a correct path of the light ray, but the direction is reversed.	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S042274

Light travels fastest through which of the following?

Ⓐ air
Ⓑ glass
Ⓒ water
Ⓓ a vacuum

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Content Domain

Physics

Topic Area

Light and Sound

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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S042317

How does water that has evaporated from the sea end up as rain on land many miles away?

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Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Applying

Maximum Points

2

Key

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Note: A fully correct response must include two or three of the following factors:
a. Clouds form (condensation)
b. The clouds move to land (blown by the wind)
c. Rain falls from clouds (because drops become too heavy/temperature drops).

Code	Response	Item: S042317
	Correct Response	
20	Mentions **two** OR **three** of the factors indicated in the note above. *Examples:* *That's because there will be condensation and the clouds form. The clouds move to land and when temperatures drop the water in the clouds condenses and fall as rain.* *It is evaporated, ends up as a cloud, blown by the wind, frozen, then melted back into rain.* *Water that has been evaporated from the sea forms clouds when it condenses in the air. As the cloud is light it can be blown to other places miles away by the wind, thus it ends up as rain miles away.* *Because the evaporated water becomes clouds and the clouds move away by the wind.* *It comes together to form a cloud and the cloud drops the rain when it is too heavy.* *Clouds in the sky may be carried by wind far away until it falls as rain.*	
	Partially Correct Response	
10	Mentions only **one** factor indicated in the note above. *Examples:* *Water vapor condenses into clouds. (a)* *Because the wind blows the clouds. (b)* *Rain falls from clouds. (c)*	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032465

Bacteria that enter the body are destroyed by which type of cells?

Ⓐ white blood cells
Ⓑ red blood cells
Ⓒ kidney cells
Ⓓ lung cells

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Content Domain

Biology

Topic Area

Human Health

Cognitive Domain

Knowing

Maximum Points

1

Key

A

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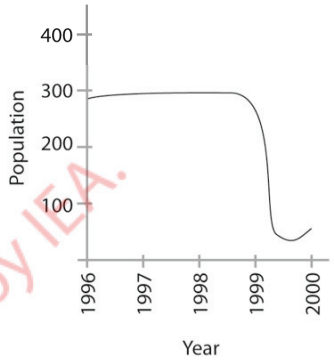

The graph indicates the number of antelopes in a certain area over a period of time. Which of the following factors is most likely to have caused the sudden change in population between 1999 and 2000?

Ⓐ global warming

Ⓑ absence of predators

Ⓒ depletion of the ozone layer

Ⓓ brush fires that destroyed the food supply

S032315

Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Reasoning

Maximum Points

1

Key

D

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Diagram 1

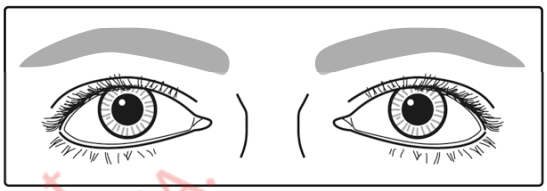
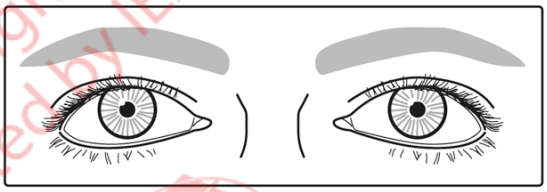


Diagram 2



Diagrams 1 and 2 illustrate the same pair of eyes that have reacted to a change in an environmental condition.

What is the environmental condition and how is it different for the eyes in Diagram 1 and Diagram 2?

S032306

Content Domain

Biology

Topic Area

Characteristics, Classification, and Life Processes of Organisms

Cognitive Domain

Applying

Maximum Points

2

Key

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Note: For full credit, responses must describe how the light level is different in Diagrams 1 and 2. Partial credit is given for responses that identify light as the environmental condition but with no description of the specific conditions in Diagrams 1 and 2. Responses that reverse the light conditions for Diagrams 1 and 2 are scored as incorrect.

Code	Response	Item: S032306
	Correct Response	
20	Indicates LIGHT and identifies which diagram corresponds to the low/high light level. Diagram 1 = dim light, low light level, darkness, or similar Diagram 2 = bright light, high light level, or similar *Examples:* *There is less light in Diagram 1. The pupil has gotten larger to let in more light.* *In Diagram 1 it is dark, and in Diagram 2 is it light.*	
29	Other fully correct	
	Partially Correct Response	
10	Indicates LIGHT but does not identify which diagram corresponds to low/high light level. *Examples:* *It is the light level. In Diagram 1, the pupils are bigger. In diagram 2 they are smaller.* *One is in brighter light than the other.*	
19	Other partially correct	
	Incorrect Response	
70	Indicates LIGHT but reverses the conditions in Diagrams 1 and 2. *Examples:* *Diagram 1 is in bright light. Diagram 2 is in dim light.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032640

State one reason why exercise is important for good health.

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Content Domain

Biology

Topic Area

Human Health

Cognitive Domain

Knowing

Maximum Points

1

Key

See scoring guide

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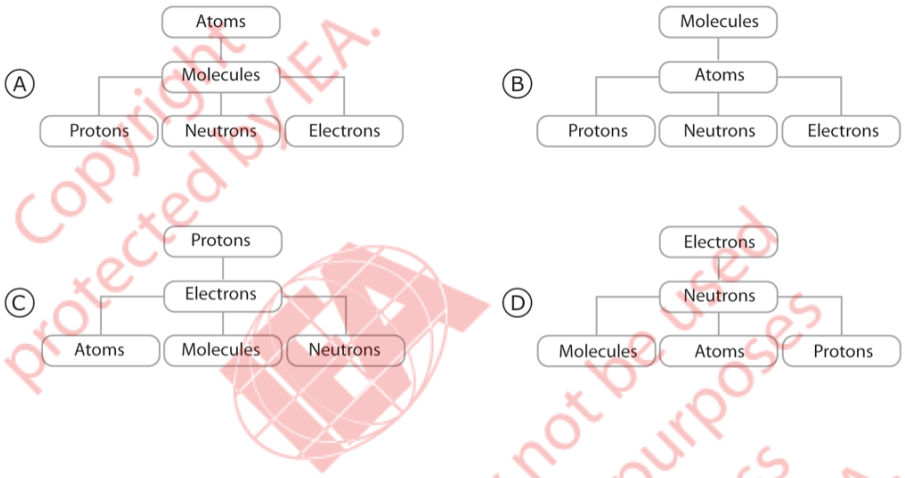
Note: To receive credit, responses must identify a specific benefit to the body (physical or mental health). General responses that refer ONLY to overall fitness, health, strength, etc., with no specific benefit named are scored as incorrect (Code 70). If more than one reason is given, the code corresponding to the first correct reason is given. Since only one reason was asked for, the incorrect portion of the response will not be considered unless it negates the correct portion.

Code	Response	Item: S032640
	Correct Response	
10	States weight loss, preventing fat storage, lowering cholesterol, or similar. *Examples:* *It burns fat.* *So you don't become overweight.* *It keeps your cholesterol at the right level.*	
11	States that exercise is beneficial for the heart, circulation, oxygen levels, or similar. *Examples:* *It keeps your heart in good condition so you don't have heart attacks.* *It gets your heart pumping faster.* *It works your cardiovascular system.* *It increases the amount of oxygen in the blood stream.*	
12	States building **muscle** strength/tone or similar. *Examples:* *It helps build muscle.* *To make your muscles stronger.* **Note**: Code 12 is to be used for responses that explicitly refer to **muscles**. If only a general response related to "strength" is given, then Code 70 should be used.	
19	Other correct *Examples:* *It can reduce stress.* *It increases flexibility and coordination.* *So your metabolism goes at its right pace and doesn't slow down too much.* *It keeps the bones healthy and fit.*	
	Incorrect Response	
70	Gives only a general response related to staying healthy, fit, being strong, or similar. *Examples:* *It keeps you healthy and fit.* *You might get ill if you don't exercise.* *Your body will last longer.* *It makes you stronger.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032579

Which of these diagrams best represents the structure of matter, starting with the more complex particles at the top and ending with the more fundamental particles at the bottom?



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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Applying

Maximum Points

1

Key

B

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S032570

David is given a sample of an unknown solid substance. He wants to know if the substance is a metal. Write down one property he can observe or measure and describe how this property could be used to help identify whether the substance is a metal.

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Content Domain

Chemistry

Topic Area

Classification and Composition of Matter

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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Note: A property will be considered correct if it applies to most common metals even if it is not generalizable to all metals (e.g., high melting point). If more than one property is given, the code corresponding to the first correct property should be given even if other incorrect properties are also included. Since only one property was asked for, the incorrect portion of the response will not be considered unless it negates the correct portion.

Code	Response	Item: S032570
	Correct Response	
10	Response based on a characteristic property of common metals that can be measured (e.g., conductor of heat, conductor of electricity, thermal expansion, density, magnetic properties, melting point). *Examples:* *He could check the expansion rate when it is heated or check the density.* *See if it conducts electricity.* *Put the object next to a magnet. If it is magnetic, then it's probably a metal.* *Check the melting point. Metals have high melting points.* **Note**: Although measurement with a magnet is not a definitive test for a metal versus non-metal, a test based on magnetic *attraction* indicating a metal will be scored as correct. Responses indicating that ALL metals are attracted to magnets or that NON-attraction indicates a non-metal will be scored as incorrect (Code 70).	
11	Response based on physical appearance or form (e.g., shiny appearance, hardness, malleability/ductility). *Examples:* *Metal is malleable and ductile. It can be bent without breaking.* *If it has shiny surfaces (lustre).* *It's shiny, unbreakable and can be polished.*	
12	Response based on chemical reactivity of metals (e.g., tendency to undergo oxidation, reaction with acid). *Examples:* *Put it in acid and see if it changes color.* *If it rusts in air, then it is metal (iron).* *Add some acid and see if there are bubbles formed because metals can react with acid.*	
19	Other correct	
	Incorrect Response	
70	Refers to a magnetic test that is incorrect; no procedure given or indicates that all metals are attracted to magnets or that NON-attraction indicates a non-metal. *Examples:* *If the substance is a metal, it will be attracted to a magnet.* *Use a magnet.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032024

Which of the following energy conversions takes place in a battery-operated flashlight?

Ⓐ electrical → mechanical → light
Ⓑ chemical → mechanical → light
Ⓒ chemical → electrical → light
Ⓓ nuclear → electrical → light

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Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Knowing

Maximum Points

1

Key

C

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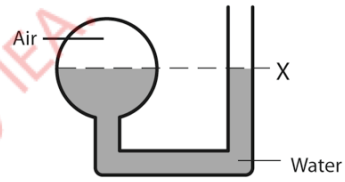
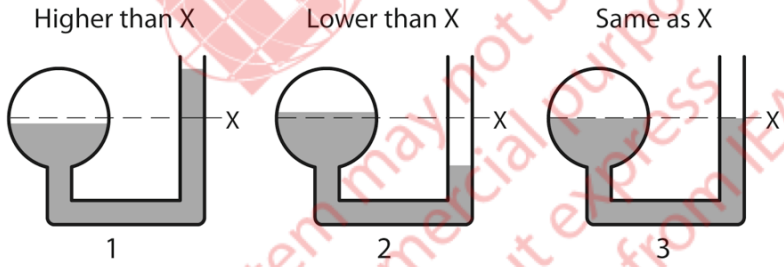
The figure shows a glass tube open at one end and connected to a closed glass sphere at the other end. The equipment is partly filled with water, as shown, so that there is air above the water in the sphere. The water in the tube reaches level X.



The air in the glass sphere is then heated by a hair dryer.

What will be the water level in the open glass tube after the sphere is heated? (Circle 1, 2 or 3 below.)



Explain your answer.

S032272

Content Domain

Physics

Topic Area

Energy Transformations, Heat, and Temperature

Cognitive Domain

Reasoning

Maximum Points

1

Key

See scoring guide

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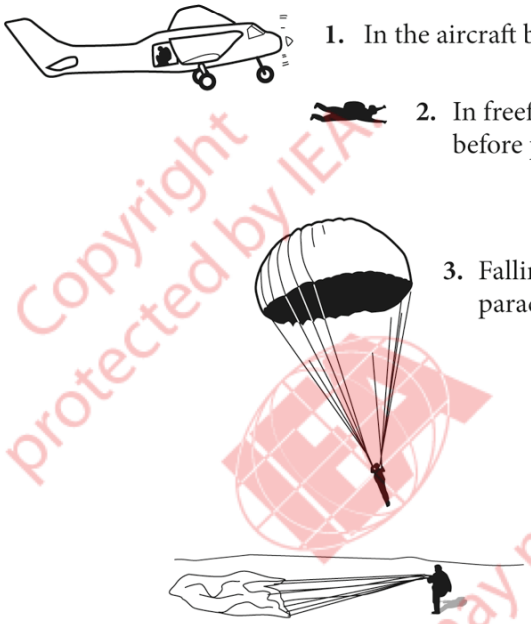
Code	Response	Item: S032272
	Correct Response	
10	HIGHER (1) with a correct explanation that refers to air expanding when heated or an increase in volume or pressure (or similar). *Examples:* *When the sphere is heated, the air expands and pushes the water up the tube.* *The pressure will make the water rise.* *The volume occupied by the air increases, so the water level has to go down in the sphere. This pushes it up higher into the tube.* *The air expands and takes up more room.*	
19	Other correct	
	Incorrect Response	
70	HIGHER (1) with no explanation or an incorrect explanation. *Examples:* *The water expanded.* *When the glass sphere was heated, the glass expanded so that caused the water to go up.* *Some of the water evaporated into the sphere so the level dropped.* *Heat forces the water back down the tube.* *Because hot air rises so there's no air to put pressure on the water.* *Hot water rises up the tube like a thermometer.*	
71	LOWER (2) with no explanation or an incorrect explanation. *Examples:* *The hot air rises and leaves more room in the sphere for the water to expand.* *Heating caused condensation and made the water level lower.* *Heat creates steam and water evaporates.*	
72	SAME (3) with no explanation or an incorrect explanation. *Examples:* *It's exactly the same amount of air and water, so the level will not change.* *It will make steam and then have no where to go so it condenses and falls back down.*	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

The figure shows a parachute jumper in four positions.



In which of the positions does the force of gravity act on the jumper?

Ⓐ Position 2 only.
Ⓑ Positions 2 and 3 only.
Ⓒ Positions 1, 2 and 3 only.
Ⓓ Positions 1, 2, 3, and 4.

S032141

Content Domain

Physics

Topic Area

Forces and Motion

Cognitive Domain

Applying

Maximum Points

1

Key

D

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S032060

The following five statements describe processes involved in the water cycle. Water evaporation from the sea is identified as a first step in the water cycle.

Number the other statements 2 through 5 in the order in which these processes take place.

_____ Water vapor rises in warm air.

_____ Water travels along a river to the sea.

__1__ Water evaporates from the sea.

_____ Water vapor is cooled and forms clouds.

_____ Clouds move and water falls on land as rain.

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Content Domain

Earth Science

Topic Area

Earth's Processes, Cycles, and History

Cognitive Domain

Applying

Maximum Points

1

Key

See scoring guide

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Code	Response	Item: S032060
	Correct Response	
10	2, 5, 1, 3, 4	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032463

Soils change both through natural processes and as a result of human activity. Which of the following soil changes is due only to natural causes?

Ⓐ degradation of nutrients due to pesticides
Ⓑ formation of deserts due to tree felling
Ⓒ flooding due to dam construction
Ⓓ removal of nutrients due to heavy rains

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Content Domain

Earth Science

Topic Area

Earth's Resources, Their Use and Conservation

Cognitive Domain

Knowing

Maximum Points

1

Key

D

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Tamora is preparing to climb one of the highest mountains on Earth. She knows that the atmospheric conditions will change the higher up the mountain she climbs.

In the table below, write down two atmospheric conditions that will change as Tamora climbs the mountain. State what Tamora needs to bring in order to survive these two conditions at high elevations.

	Change in Atmospheric Condition	What Tamora Needs to Bring
1.		
2.		

S032650

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Content Domain

Earth Science

Topic Area

Earth's Structure and Physical Features

Cognitive Domain

Applying

Maximum Points

2

Key

See scoring guide

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Note: Each of the two responses is coded separately. Each correct diagnostic code (10, 11, 12) may be used only once. If the two responses are essentially the same, the second response should be coded as 79. For example, if a response mentions oxygen and air, the first response is given a Code 11 and the second response is given a Code 79. If only one response is given, the second should be coded as 99. Responses are given credit if they indicate how the atmospheric condition *changes* as a function of altitude. Information given in both columns should be used to evaluate each response. Benefit of the doubt should be given to a response with a general statement of the condition as long as the equipment listed demonstrates the direction of change. For example, temperature/warm clothes implies that the temperature decreases and air/oxygen tank implies that the oxygen level decreases. If only the condition is listed with no equipment, credit will be given as long as the direction of change is clear.

Two correct responses will be given 2 score points and one correct response will be given 1 score point.

Code	Response	Item: S032650A, B
	Correct Response	
10	Indicates that the temperature will decrease (or similar). *Examples:* *The temperature will be colder. [More clothes.]*	
11	Indicates that there will be less oxygen (air) or lower atmospheric pressure (or similar). *Examples:* *Air will get thinner. [Oxygen mask.]* *The air pressure decreases. [Bring air tank.]* *It will be difficult to breathe. [Needs air tank.]* **Note:** If a response states that the atmospheric pressure **increases** at higher altitude, it should be scored as incorrect (Code 71) even if the corresponding equipment given is oxygen tank or similar.	
12	Indicates increased precipitation (snow, rain) or clouds (or similar). *Examples:* *It will get icy. [Bring ice shoes.]* *There will be more rain. [Needs rain coat.]*	
19	Other correct *Examples:* *The Sun's rays are stronger. [Suntan lotion and sunglasses].* *Gusts of wind. [Windbreaker.]*	
	Incorrect Response	
70	Mentions a type of equipment, but does not clearly indicate how the atmospheric condition changes. *Examples:* *Atmospheric conditions change from halfway up the mountain to the top. [Bring tanks.]*	
71	Mentions that the atmospheric pressure **increases** with or without listing oxygen equipment.	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

S032514

In a lake near a farm the growth of algae suddenly increased. This increase was most likely due to which of the following?

Ⓐ a decrease in air temperature
Ⓑ a decrease in water level
Ⓒ fertilizer runoff from the farm
Ⓓ exhaust gases from farm equipment

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Content Domain

Biology

Topic Area

Ecosystems

Cognitive Domain

Applying

Maximum Points

1

Key

C

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International Study Center
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ISBN: 978-1-889938-13-4

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