

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Electricity and Magnetism	Conceptual Understanding

Which bulb will light

The pictures show a lightbulb connected to a battery.
Which bulb will light?

(A) (B) (C) (D)

Overall Percent Correct

Japan	95	▲
Hong Kong, SAR	94	▲
Chinese Taipei	91	▲
England	89	▲
Singapore	85	▲
Cyprus	81	▲
Slovenia	81	▲
United States	81	▲
New Zealand	80	▲
Latvia	79	▲
Lithuania	79	▲
Australia	78	○
Scotland	78	○
Russian Federation	77	○
Italy	76	○
Moldova, Republic of	75	○
Belgium (Flemish)	75	○
International average	75	
Hungary	74	○
Norway	72	○
Philippines	72	○
Netherlands	66	▼
Iran, Islamic Republic of	65	▼
Armenia	53	▼
Tunisia	37	▼
Morocco	31	▼

Country average vs. International average:

- Higher ▲
- Not different ○
- Lower ▼

Item Number: S031038

Correct Response:	C
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Electricity and Magnetism	Conceptual Understanding

Figure where two magnets repel

Figure 1 S N N S

Figure 2 S N S N

Figure 3 N S N S

Figure 4 N S S N

Which of the figures above shows a situation where two magnets repel each other?

(A) Figures 1 and 3
 (B) Figures 2 and 3
 (C) Figures 1 and 4
 (D) Figures 1, 2, 3, and 4

Overall Percent Correct

Singapore	73	▲
Japan	65	▲
Chinese Taipei	62	▲
Hong Kong, SAR	54	▲
United States	50	▲
England	44	▲
Russian Federation	41	○
Netherlands	40	○
Australia	39	○
Hungary	38	○
International average	38	
Armenia	37	○
Italy	36	○
Moldova, Republic of	36	○
Scotland	34	▼
Cyprus	33	▼
Lithuania	33	▼
New Zealand	33	▼
Belgium (Flemish)	33	▼
Latvia	31	▼
Slovenia	28	▼
Iran, Islamic Republic of	27	▼
Norway	24	▼
Philippines	22	▼
Morocco	21	▼
Tunisia	19	▼

Country average vs. International average:

Higher ▲
 Not different ○
 Lower ▼

Item Number: S031306

Correct Response:	C
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Energy Types, Sources, and Conversions	Conceptual Understanding

Renewable energy source

A renewable energy source is a source that will not run out. Which is an example of the use of such a source?

- (A) A coal furnace heating a house
- (B) A windmill pumping water on a farm
- (C) A kerosene lamp lighting a room
- (D) A diesel truck traveling along a road

Overall Percent Correct

Japan	71	▲
Hong Kong, SAR	64	▲
Chinese Taipei	60	▲
Latvia	54	▲
Australia	52	▲
Netherlands	52	▲
England	52	▲
Belgium (Flemish)	52	▲
New Zealand	51	▲
United States	51	▲
Cyprus	49	▲
Russian Federation	48	○
Armenia	46	○
Lithuania	45	○
Norway	45	○
International average	45	
Singapore	44	○
Scotland	44	○
Slovenia	37	▼
Italy	36	▼
Moldova, Republic of	36	▼
Morocco	35	▼
Hungary	34	▼
Philippines	30	▼
Iran, Islamic Republic of	22	▼
Tunisia	18	▼

Country average vs.
International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S011011

Correct Response:

B

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Forces and Motion	Conceptual Understanding

Objects floating in water

The picture shows three solid objects of the same size floating in water.

Which object weighs the most?

(A) Object A
 (B) Object B
 (C) Object C
 (D) They all weigh the same.

Overall Percent Correct

Japan	94	▲
Netherlands	92	▲
Singapore	92	▲
England	92	▲
Chinese Taipei	91	▲
Norway	91	▲
United States	91	▲
Scotland	91	▲
Belgium (Flemish)	91	▲
Australia	90	▲
Cyprus	90	▲
New Zealand	90	▲
Hong Kong, SAR	89	▲
Italy	89	▲
Hungary	88	▲
Slovenia	88	▲
Latvia	85	○
Russian Federation	85	○
Lithuania	84	○
International average	83	
Moldova, Republic of	82	○
Armenia	72	▼
Iran, Islamic Republic of	70	▼
Philippines	52	▼
Morocco	50	▼
Tunisia	50	▼

Country average vs. International average:	
Higher	▲
Not different	○
Lower	▼

Item Number: S011001

Correct Response:	B
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Forces and Motion	Factual Knowledge

Which can make objects repel

Which of the following can make objects repel each other?

Ⓐ gravity

Ⓑ magnetism

Ⓒ both gravity and magnetism

Ⓓ neither gravity nor magnetism

Overall Percent Correct

Japan	70	▲
Chinese Taipei	64	▲
Hungary	57	▲
Singapore	56	▲
England	50	▲
Cyprus	46	▲
United States	45	▲
Lithuania	43	▲
Hong Kong, SAR	42	○
Latvia	41	○
Scotland	41	○
Italy	39	○
International average	39	
Netherlands	37	○
Russian Federation	37	○
Australia	35	○
Moldova, Republic of	32	▼
Iran, Islamic Republic of	31	▼
Morocco	29	▼
New Zealand	29	▼
Belgium (Flemish)	29	▼
Norway	26	▼
Slovenia	26	▼
Tunisia	24	▼
Armenia	23	▼
Philippines	19	▼

Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

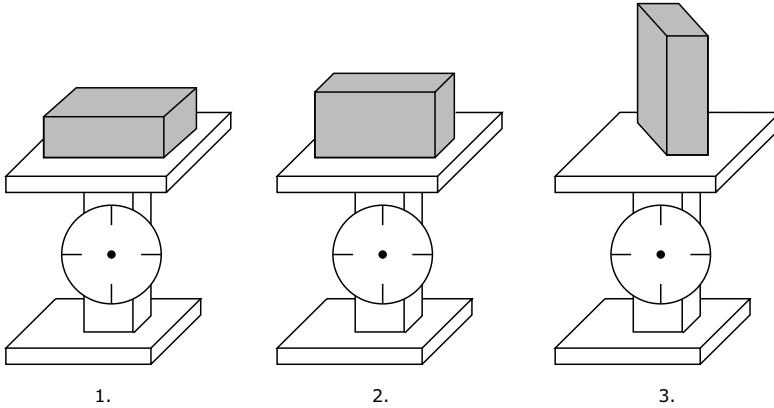
Item Number: S031313

Correct Response:	B
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Forces and Motion	Reasoning and Analysis

Weight on scale

The same brick is put on a scale in three different ways.



What will the scale show?

- (A) 1 will show the greatest weight.
 (B) 2 will show the greatest weight.
 (C) 3 will show the greatest weight.
 (D) All will show the same weight.

Overall Percent Correct

Lithuania	88	▲
Moldova, Republic of	87	▲
Russian Federation	86	▲
Chinese Taipei	85	▲
Slovenia	85	▲
Latvia	84	▲
Hungary	79	▲
Singapore	79	▲
Italy	78	▲
England	76	▲
Australia	74	○
Armenia	74	○
Netherlands	74	○
United States	73	○
Belgium (Flemish)	73	○
Iran, Islamic Republic of	72	○
International average	72	
Hong Kong, SAR	69	○
Scotland	68	▼
Japan	66	▼
New Zealand	66	▼
Cyprus	63	▼
Morocco	54	▼
Norway	54	▼
Philippines	52	▼
Tunisia	45	▼

**Country average vs.
International average:**

Higher	▲
Not different	○
Lower	▼

Item Number: S011009

Correct Response:

D

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Heat and Temperature	Conceptual Understanding

Why made of copper

Jessica gave some reasons why kettles and kitchen pans are often made of copper. Which reason is correct?

- (A) Copper is a good conductor of heat.
- (B) Copper is easy to melt.
- (C) Copper is difficult to shape.
- (D) Copper dissolves in hot water.

Overall Percent Correct

Singapore	87	▲
Chinese Taipei	84	▲
Japan	82	▲
Russian Federation	81	▲
England	79	▲
United States	74	▲
Latvia	73	▲
Scotland	72	▲
Australia	70	▲
New Zealand	69	▲
Hong Kong, SAR	66	▲
Lithuania	65	○
Italy	63	○
Belgium (Flemish)	62	○
International average	62	
Slovenia	61	○
Cyprus	57	▼
Netherlands	56	▼
Moldova, Republic of	55	▼
Norway	49	▼
Iran, Islamic Republic of	45	▼
Philippines	45	▼
Morocco	44	▼
Hungary	38	▼
Tunisia	37	▼
Armenia	36	▼

Country average vs.
International average:

Higher	▲
Not different	○
Lower	▼

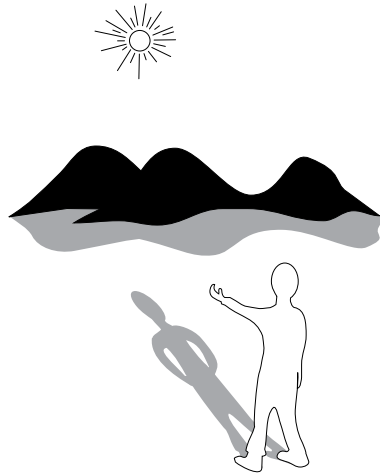
Item Number: S011014

Correct Response:

A

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Light	Conceptual Understanding

Two things wrong with the shadow



There are two things wrong with the shadow of the man shown in the picture above.

Write down the two things that are wrong.

1.

2.

Overall Percent Correct

Japan	63	▲
Singapore	48	▲
England	46	▲
Hong Kong, SAR	44	▲
Latvia	39	▲
Chinese Taipei	38	▲
Australia	31	○
Hungary	31	▲
Russian Federation	31	▲
New Zealand	30	▲
United States	27	○
Belgium (Flemish)	26	○
International average	25	
Italy	23	○
Lithuania	21	○
Cyprus	20	○
Scotland	18	▼
Slovenia	17	▼
Norway	13	▼
Armenia	10	▼
Iran, Islamic Republic of	7	▼
Philippines	5	▼
Morocco	4	▼
Tunisia	3	▼
Moldova, Republic of	1	▼
Netherlands	0	▼

Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S031072

Two things wrong with the shadow (continued)

Item Number: S031072

SCORING

Note: To receive full credit, responses must identify an error in both the direction/angle and the pose of the shadow of the man. Direction/angle: shadow should be on the other side of the man away from the sun. Pose: shadow of the left hand should be raised; shadow on the right hand should be down at his side. Partial credit is given for responses that address only one of these factors. Statements about the shadow of the mountains do not contribute to the correctness of the score.

Fully Correct Response

- Identifies an error in BOTH the direction/angle and the pose of the shadow of the man.
Examples: The shadow should have the main raising one hand. The shadow should be opposite the sun.
The man's hand is sticking out, but the shadow is not. The shadow is not behind him.
The position of the shadow is wrong. The shape of the shadow is wrong.
The man has his arm out and the shadow has it on his hip. The shadow is on the side facing the sun.

- Other fully correct

Partial Response

- Identifies only the direction/angle of the shadow of the man. [No mention of the pose.]
Examples: The shadow is on the wrong side of the man. The hill has a bump, but its shadow has a curve.
- Identifies only the pose of the shadow of the man. [No mention of the direction/angle.]
Examples: He put out his hand, but the shadow did not show it right. His other hand is straight but the shadow is not.

- Other partially correct

Incorrect Response

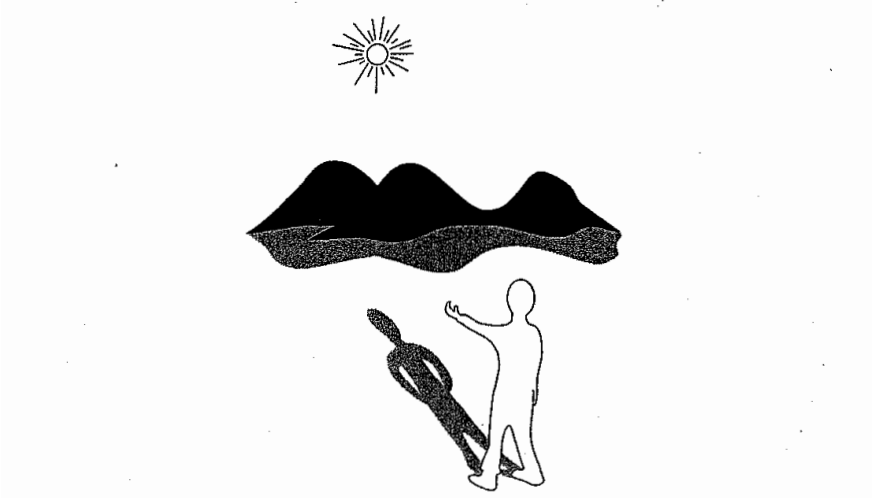
- Response too vague.
Examples: The shadow of the man. The shadow of the hill.
The hands. The head.
- Incorrect (including crossed out/erased, stray marks, illegible or off task)
Examples: He has no hair. He has no face.

Two things wrong with the shadow (continued)

Item Number: S031072

Student Responses

Correct Response:



There are two things wrong with the shadow of the man shown in the picture above.

Write down the two things that are wrong.

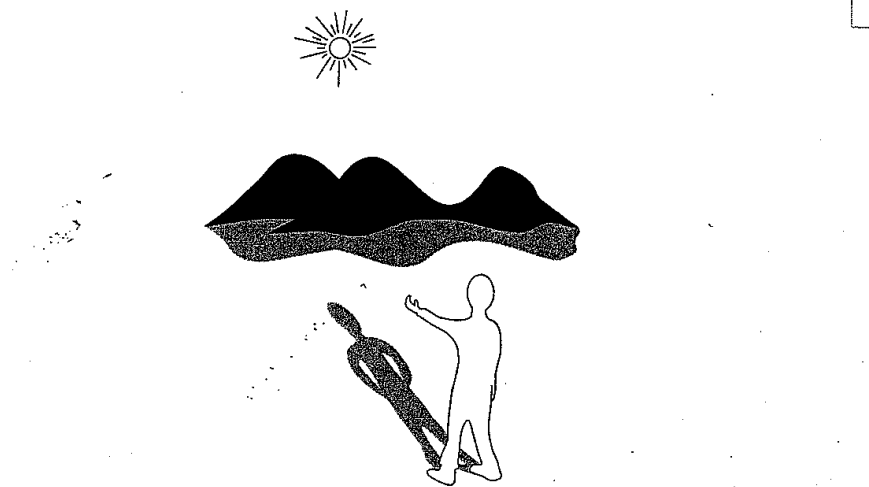
1. His arm isn't sticking out.
2. The shadow isn't behind him.
It should be because the sun's in front of him.

Two things wrong with the shadow (continued)

Item Number: S031072

Student Responses (continued)

Partially Correct Response:



There are two things wrong with the shadow of the man shown in the picture above.

Write down the two things that are wrong.

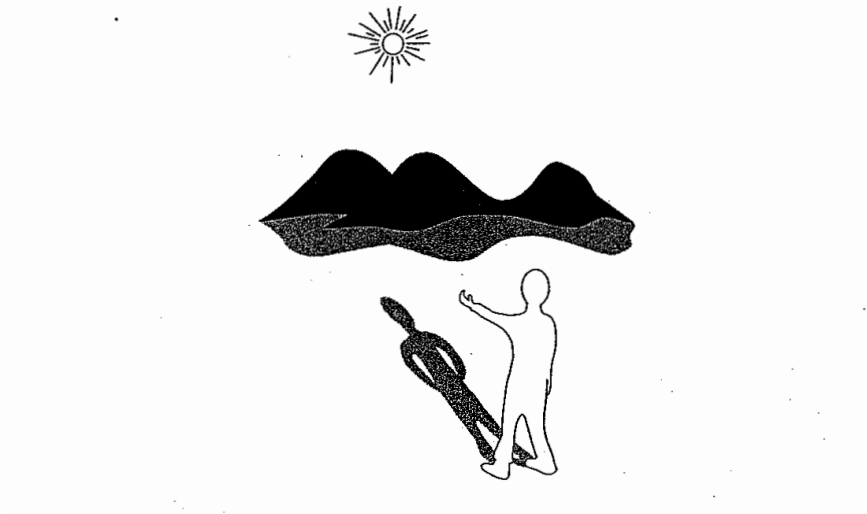
1. His head is wide not tall
2. His arm is in the air and the other one is tucked in

Two things wrong with the shadow (continued)

Item Number: S031072

Student Responses (continued)

Incorrect Response:



There are two things wrong with the shadow of the man shown in the picture above.

Write down the two things that are wrong.

1. the shadows hands is wrong
2. And the mountains are wrong

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Light	Factual Knowledge

Which could cause rainbow

Which pair together could cause a rainbow?

Ⓐ Fog and clouds

Ⓑ Rain and snow

Ⓒ Clouds and ice

Ⓓ Sunshine and rain

Overall Percent Correct

Belgium (Flemish)	98	▲
Hungary	97	▲
Latvia	97	▲
Netherlands	97	▲
England	97	▲
Scotland	97	▲
Hong Kong, SAR	96	▲
Chinese Taipei	95	▲
New Zealand	95	▲
Norway	95	▲
Slovenia	95	▲
United States	95	▲
Lithuania	94	▲
Russian Federation	94	▲
Australia	93	▲
Italy	93	▲
Japan	93	▲
Moldova, Republic of	93	▲
Singapore	93	▲
International average	88	
Armenia	87	○
Cyprus	77	▼
Iran, Islamic Republic of	67	▼
Philippines	62	▼
Morocco	56	▼
Tunisia	49	▼

Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S011029

Correct Response:	D
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Physical States and Changes in Matter	Conceptual Understanding

Soap bubbles

When you make soap bubbles, what is inside the bubbles?

Ⓐ Air
 Ⓑ Soap
 Ⓒ Water
 Ⓓ Nothing

Overall Percent Correct

Japan	82	▲
Russian Federation	81	▲
Hungary	80	▲
Singapore	80	▲
England	78	▲
Netherlands	77	▲
United States	76	▲
Moldova, Republic of	75	▲
Italy	70	▲
Latvia	70	▲
Lithuania	70	○
Australia	69	○
New Zealand	67	○
International average	66	
Armenia	64	○
Chinese Taipei	64	○
Cyprus	64	○
Slovenia	64	○
Belgium (Flemish)	64	○
Norway	60	▼
Scotland	57	▼
Hong Kong, SAR	51	▼
Iran, Islamic Republic of	48	▼
Philippines	48	▼
Morocco	43	▼
Tunisia	38	▼

Country average vs.
International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S011017

Correct Response:	A
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Physical States and Changes in Matter	Conceptual Understanding

Boiling water

What happens to water when it boils?

Ⓐ It changes color.

Ⓑ It becomes heavier.

Ⓒ It changes into water vapor.

Ⓓ It stops bubbling.

Overall Percent Correct

Italy	95	▲
Japan	93	▲
Latvia	91	▲
Moldova, Republic of	91	▲
Slovenia	91	▲
Hungary	90	▲
Cyprus	88	▲
Hong Kong, SAR	88	▲
Russian Federation	88	▲
England	88	▲
Chinese Taipei	87	▲
Singapore	87	▲
Netherlands	86	○
Norway	86	▲
Belgium (Flemish)	85	▲
Lithuania	83	○
United States	82	○
International average	82	
Iran, Islamic Republic of	78	▼
Armenia	76	▼
Australia	72	▼
New Zealand	72	▼
Scotland	69	▼
Morocco	66	▼
Philippines	66	▼
Tunisia	62	▼

Country average vs.
International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S011030

Correct Response:	C
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Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Physical States and Changes in Matter	Conceptual Understanding

Difference between solids and liquids

Describe one difference between solids and liquids.

Overall Percent Correct

England	74	▲
Singapore	73	▲
United States	67	▲
Chinese Taipei	66	▲
Australia	64	▲
Hungary	64	▲
New Zealand	62	▲
Japan	59	▲
Scotland	57	▲
Hong Kong, SAR	56	▲
Italy	55	▲
Slovenia	51	▲
Russian Federation	49	▲
Latvia	44	○
International average	44	
Cyprus	41	○
Moldova, Republic of	37	▼
Belgium (Flemish)	32	▼
Lithuania	30	▼
Iran, Islamic Republic of	29	▼
Philippines	22	▼
Armenia	21	▼
Netherlands	21	▼
Norway	16	▼
Tunisia	11	▼
Morocco	8	▼

Item Number: S031370

SCORING

Correct Response

- Refers to differences in arrangement (space, distance) or speed of particles (molecules).
Examples: In solids molecules are packed together.
Liquid particles are more spread out and fast.
- Refers to solids having a fixed shape OR liquids taking the shape of their container (or similar)
Examples: Liquids can fill the shape of any container; solids can not.
A liquid can take any form.
- Refers to solids as hard OR liquids as soft, wet, flowing, runny, poured (or similar).
Examples: Solids can't spill and liquids can.
Liquids can be poured.
You can drink liquids, you cannot drink solids.
Solids are hard and liquids are soft.
- Other correct
Examples: Solids can be melted into liquid, but liquids are already liquid.

Incorrect Response

- Refers only to examples of solids/liquids with no or incorrect property given.
Examples: Water is a liquid and ice is a solid.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)
Examples: Solids are cold.
One is harder than the other.
A solid is strong.

Country average vs.
International average:

Higher	▲
Not different	○
Lower	▼

Difference between solids and liquids (continued)

Item Number: S031370

Student Responses

Correct Response:

Describe one difference between solids and liquids.

Solids molecules are packed together so tight that when they move such a small amount that they move together. Liquids are more spaced out move faster and can take the shape of a container.


Incorrect Response:

Describe one difference between solids and liquids.

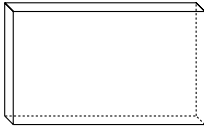
Solids are solid and liquid are like water.

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Physical States and Changes in Matter	Reasoning and Analysis

Solid, liquid, and gas in a container/identify

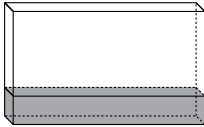


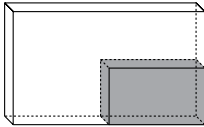
The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.




Look at the figures **below**. They show how the different types of material will look when put into the larger box.

A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)







B. Explain your answers.

Item Number: S031372A

SCORING

Note: If any state (solid, liquid or gas) is listed more than once, then none of the duplicated responses will be considered correct. For example, a response of "liquid, gas, gas" should be scored incorrect.

Correct Response

- Identifies all 3 correctly: **Liquid – Solid - Gas**

Incorrect Response

- Only **liquid** is correct.
- Only **solid** is correct.
- Only **gas** is correct.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	83	▲
Hong Kong, SAR	81	▲
Latvia	77	▲
Italy	76	▲
England	74	▲
Hungary	72	▲
Chinese Taipei	71	▲
Japan	70	▲
Russian Federation	70	▲
Lithuania	68	▲
Slovenia	66	▲
United States	61	▲
New Zealand	60	○
Moldova, Republic of	59	○
International average	57	
Australia	56	○
Scotland	55	○
Cyprus	49	▼
Belgium (Flemish)	45	▼
Netherlands	41	▼
Iran, Islamic Republic of	37	▼
Philippines	35	▼
Norway	34	▼
Armenia	33	▼
Tunisia	26	▼
Morocco	20	▼

Country average vs. International average:

- Higher ▲
- Not different ○
- Lower ▼

Solid, liquid, and gas in a container/identify (continued)

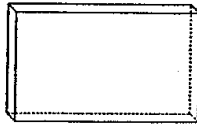
Item Number: S031372A

Student Responses

Correct Response:

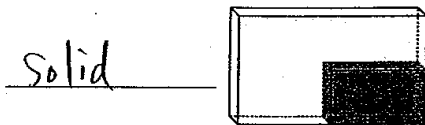
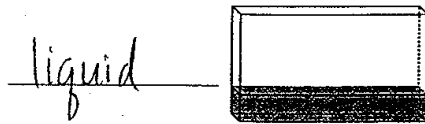


The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



Look at the figures **below**. They show how the different types of material will look when put into the larger box.

A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)



Solid, liquid, and gas in a container/identify (continued)

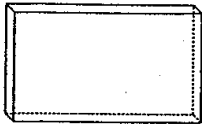
Item Number: S031372A

Student Responses (continued)

Incorrect Response:

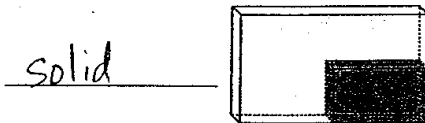
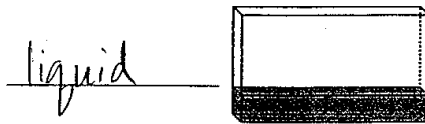


The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



Look at the figures below. They show how the different types of material will look when put into the larger box.

- A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)

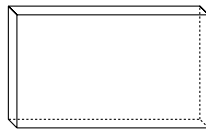


Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Physical States and Changes in Matter	Reasoning and Analysis

Solid, liquid, and gas in a container/explain

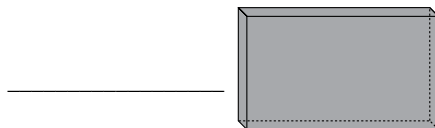
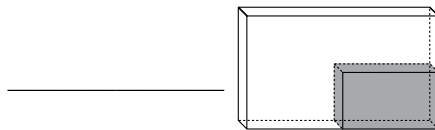
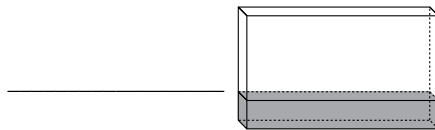


The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



Look at the figures **below**. They show how the different types of material will look when put into the larger box.

- A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)



- B. Explain your answers.

Overall Percent Correct

Japan	30	▲
Lithuania	28	▲
Singapore	28	▲
Chinese Taipei	26	▲
New Zealand	25	▲
Hungary	24	▲
Australia	22	▲
Latvia	21	▲
England	20	▲
Italy	19	▲
United States	18	▲
Russian Federation	17	○
Cyprus	16	○

International average	15	
Slovenia	12	▼
Hong Kong, SAR	11	▼
Netherlands	10	▼
Scotland	10	▼
Norway	7	▼
Belgium (Flemish)	7	▼
Iran, Islamic Republic of	6	▼
Philippines	4	▼
Armenia	3	▼
Moldova, Republic of	3	▼
Morocco	1	▼
Tunisia	1	▼

Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Solid, liquid, and gas in a container/explain (continued)

Item Number: S031372B

SCORING

Fully Correct Response

- Explanation refers to at least one property of each of the three states that differentiates them:
 - i) **Liquids:** flow (or take the shape of their container); cannot be compressed; have a definite or fixed volume; seek the lowest level (or similar).
 - ii) **Solids:** keep a definite or fixed shape (volume); are hard (objects); cannot be compressed.
 - iii) **Gases:** expand or can be compressed (to fill a container of different sizes/shapes); can spread out, can rise (or similar).

Examples: Liquid can take any shape or form; solid can be hard; gas can take up a lot of room.

Liquid runs and finds the lowest level; solid keeps the same shape; gas takes up all the room. Liquid would flow down and cover the bottom; solid is formed into a shape and leave some room on the bottom; gas would spread out.

Water cannot be compressed; solid is an object; air can be compressed.

- Other fully correct

Partially Correct Response

- Explanation includes a property that correctly differentiates at least one of the states (solid, liquid or gas) but not all three.

Examples: Solids remain the same, gases go everywhere.

Liquids run, gases evaporate; solids don't go anywhere.

The solid stays the same. The gas expands all the way.

Liquid and gas both follow the shape of the container; solids have a definite shape.

- Other partially correct

Incorrect Response

- Refers to observations, uses or examples of solids, liquids or gases, but inadequate for answering question.

Examples: The liquid is water; the solid is a block of wood; the gas is oxygen.

Solids are heavier.

Blocks are made of solids.

- Other incorrect (including crossed out/erased, stray marks, illegible or off task)

Solid, liquid, and gas in a container/explain (continued)

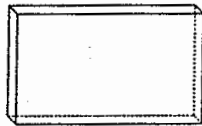
Item Number: S031372B

Student Responses

Correct Response:

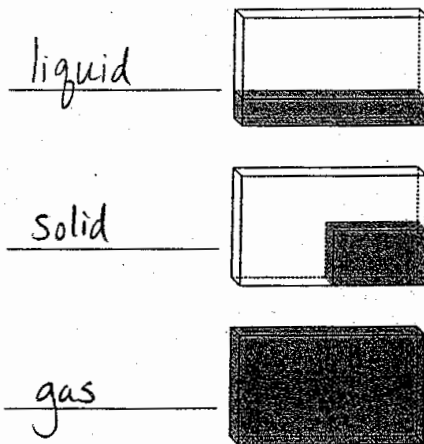


The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



Look at the figures below. They show how the different types of material will look when put into the larger box.

- A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)



- B. Explain your answers.

Liquid has no definite shape but has a definite volume. Solid has a definite shape and volume but Gas has no definite shape and volume.

Solid, liquid, and gas in a container/explain (continued)

Item Number: S031372B

Student Responses (continued)

Partially Correct Response:

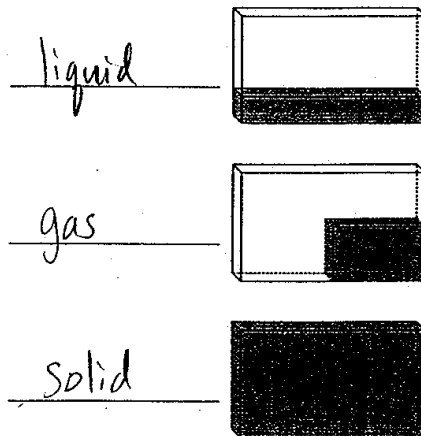


The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



Look at the figures below. They show how the different types of material will look when put into the larger box.

- A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)



- B. Explain your answers.

The bottom one is a solid because it has no spaces left. The top one's a liquid cause it's spread out in the box. The middle ones a gas cause it's not so spaced around.

Solid, liquid, and gas in a container/explain (continued)

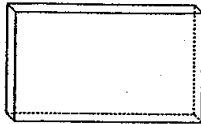
Item Number: S031372B

Student Responses (continued)

Incorrect Response:





The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.

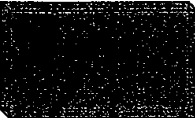


Look at the figures below. They show how the different types of material will look when put into the larger box.

A. Identify which figure shows a solid, which shows a liquid and which shows a gas. (Write the word *solid*, *liquid* or *gas* on the line next to each figure below. Use each word only once.)

liquid _____ 

solid _____ 

solid _____ 

B. Explain your answers.

Number 1, It is a liquid because it is water.
 Number 2, It is standing stright like solid.
 Number 3, It is all solid.

Content Domain	Main Topic	Cognitive Domain
PHYSICAL SCIENCE	Properties and Uses of Water	Reasoning and Analysis

Closed glass bottle filled with water

A closed glass bottle filled with water was left in the freezer overnight.
In the morning the glass was found broken.

Why did freezing the water cause the bottle to break?

Overall Percent Correct

Russian Federation	39	▲
Australia	29	▲
Japan	27	▲
Moldova, Republic of	27	▲
Singapore	27	▲
Italy	25	▲
Norway	24	▲
England	24	▲
Hong Kong, SAR	23	▲
United States	23	▲
Lithuania	22	○
New Zealand	22	○
Latvia	21	○
Netherlands	21	○
Hungary	19	○
International average	19	
Armenia	18	○
Belgium (Flemish)	15	▼
Chinese Taipei	14	▼
Slovenia	14	▼
Scotland	13	▼
Cyprus	9	▼
Morocco	7	▼
Iran, Islamic Republic of	6	▼
Tunisia	4	▼
Philippines	1	▼

Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S031005

SCORING

Correct Response

- Refers to water expanding or increasing in volume (explicitly or implicitly).
Examples: *Water expanded.*
Its volume increased.
There was not enough room in the bottle for the water to freeze.
The water got bigger when it froze.
When water freezes it expands.
- Other correct

Incorrect Response

- Refers ONLY to water freezing or turning into ice (or similar). [No mention of water expansion.]
Examples: *It turned into ice and broke.*
It turned into solid.
Because of the ice.
The freezer was too cold and it froze the water so hard it broke the glass.
- Refers ONLY to pressure or force of ice (or similar). [No mention of water expansion.]
Examples: *The pressure on the inside.*
The force of water and cold air broke the glass.
Because of the pressure from the ice.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)
Examples: *The glass froze and turned to ice.*
It got too cold

Closed glass bottle filled with water (continued)

Item Number: S031005

Student Responses

Correct Response:

A closed glass bottle filled with water was left in the freezer overnight.
In the morning the glass was found broken.

Why did freezing the water cause the bottle to break?

The ice grew so
much inside the bottle
that it just exploded

Incorrect Response:

A closed glass bottle filled with water was left in the freezer overnight.
In the morning the glass was found broken.

Why did freezing the water cause the bottle to break?

It caused to break
because it had too much
carbon dioxide.