TIMSS USA 4

# RELEASED SCIENCE ITEMS

This book contains the released Trends in International Mathematics and Science Study (TIMSS) 2003 grade 4 science assessment items. This is not a complete set of all TIMSS 2003 assessment items because some items are kept confidential so that they may be used in subsequent cycles of TIMSS to measure trends.

## How Can This Set of Released Items Be Used?

**In teacher-designed assessments.** The items in this book present different ways of measuring students' understanding in various content and cognitive domains. A teacher may use these items to create an assessment according to the needs of the class after reviewing the items and selecting items of interest.

**For feedback on student understanding.** Student responses can be scored according to the scoring information provided in the book. Items that coincide with concepts taught in class allow the teacher to gain feedback on the students' understanding of assessed concepts. For example, a teacher might decide to examine the incorrect or partially correct responses of the class. The teacher might use the items to identify particular difficulties or misconceptions experienced by individual students, which can serve as the basis for some remedial teaching or focused practice.

**To benchmark student performance.** The teacher might also compare the percent of students in the class who responded correctly to an item with the percent of students who responded correctly to the same item in other education systems or in the United States.

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## Guide to the Content and Layout of This Book

This book contains the released items from TIMSS 2003. Due to slight revisions in terminology and released information between cycles, the format for the items in each cycle differs slightly. Each item appears on a single page and is accompanied by a number of descriptors.

**2003 Content Domains**:

- Physical science (chemistry and physics)
- Earth Science
- Life Science

**2003 Cognitive Domains**:

- Factual knowledge
- Conceptual understanding
- Reasoning and analysis

Looking at *Which decays fastest*, the first item from TIMSS 2003, the content domain (*physical science*) and the cognitive domain (*conceptual understanding*) are also accompanied by the main topic (*chemical change*).

**International item numbers** identify each item. This number appears just below the item box.

**Correct answers** are shown beneath each item. These correct answers take two forms:

- **Letter code**. This form is used for the correct response on multiple-choice items.
- **Scoring guide**. This form is used to assist in scoring write-in responses. In some cases, partial credit may be awarded and these items will provide guidelines for fully correct, partially correct, and incorrect responses.

**Sample student responses** are provided for some extended response items.

**International benchmarks** are provided in a table next to each item. These consist of statistics on the percentage of students in each country who answered the question correctly. The countries are ordered in terms of this percentage. The international average is included as well, and this display also indicates which countries scored significantly higher, significantly lower, and not significantly different from this international average.

| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Chemical Change | Conceptual Understanding |

## Which decays fastest

If you throw each one of these things away, which will decay fastest?

Ⓐ A glass bottle

Ⓑ A metal can

Ⓒ A plastic bottle

Ⓓ An apple core

*Item Number: S011008*

**Overall Percent Correct**

| | | |
|---|---|---|
| Belgium (Flemish) | 94 | ▲ |
| Chinese Taipei | 93 | ▲ |
| Japan | 92 | ▲ |
| Russian Federation | 92 | ▲ |
| Norway | 91 | ▲ |
| Netherlands | 86 | ▲ |
| Latvia | 79 | ▲ |
| England | 77 | ▲ |
| United States | 73 | ▲ |
| Hong Kong, SAR | 72 | ▲ |
| New Zealand | 70 | ▲ |
| Australia | 69 | O |
| Iran, Islamic Republic of | 69 | O |
| Singapore | 67 | O |
| Hungary | 66 | O |
| **International average** | **65** | |
| Lithuania | 64 | O |
| Scotland | 63 | O |
| Italy | 62 | O |
| Slovenia | 47 | ▼ |
| Cyprus | 42 | ▼ |
| Morocco | 29 | ▼ |
| Philippines | 29 | ▼ |
| Tunisia | 23 | ▼ |
| Moldova, Republic of | 22 | ▼ |
| Armenia | 0 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | D |
|---|---|

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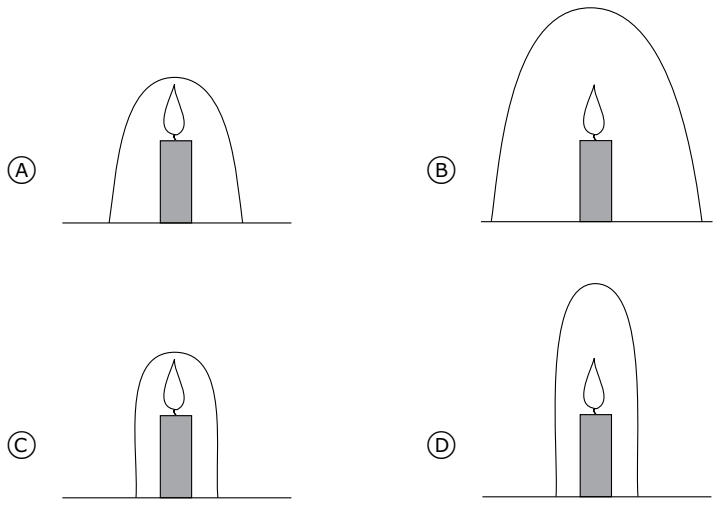
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Chemical Change | Conceptual Understanding |

## Candle flame last to go out

The pictures below show four identical burning candles. Each is covered by a glass container of a different size. Which candle flame will be the **last** to go out?




*Item Number: S031061*

**Overall Percent Correct**

| | | |
|---|---|---|
| Cyprus | 81 | ▲ |
| Netherlands | 81 | ▲ |
| Singapore | 81 | ▲ |
| Hong Kong, SAR | 80 | ▲ |
| Hungary | 79 | ▲ |
| Latvia | 78 | ▲ |
| Belgium (Flemish) | 78 | ▲ |
| Chinese Taipei | 75 | ▲ |
| Italy | 74 | ▲ |
| Slovenia | 73 | O |
| United States | 72 | ▲ |
| Lithuania | 71 | O |
| England | 69 | O |
| Norway | 68 | O |
| Australia | 66 | O |
| Russian Federation | 66 | O |
| **International average** | **66** | |
| Scotland | 65 | O |
| New Zealand | 63 | O |
| Moldova, Republic of | 61 | O |
| Armenia | 55 | ▼ |
| Iran, Islamic Republic of | 52 | ▼ |
| Japan | 51 | ▼ |
| Philippines | 47 | ▼ |
| Morocco | 34 | ▼ |
| Tunisia | 30 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | B |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| PHYSICAL SCIENCE | Chemical Change | Conceptual Understanding |

## Activity that results in new material

Which of these activities will result in a different kind of material being formed?

Ⓐ A nail is left outside and it rusts.

Ⓑ A glass is dropped and it shatters into small pieces.

Ⓒ A rubber band is stretched until it breaks.

Ⓓ A pencil is sharpened to a point.

*Item Number: S031420*

**Overall Percent Correct**

| | | |
|---|---|---|
| Hong Kong, SAR | 61 | ▲ |
| Chinese Taipei | 57 | ▲ |
| Hungary | 55 | ▲ |
| Russian Federation | 51 | ▲ |
| Italy | 49 | ▲ |
| Latvia | 49 | ▲ |
| England | 47 | ▲ |
| New Zealand | 43 | ▲ |
| Armenia | 41 | O |
| Australia | 40 | O |
| Japan | 40 | O |
| Lithuania | 39 | O |
| Scotland | 39 | O |
| Singapore | 38 | O |
| **International average** | **38** | |
| Netherlands | 37 | O |
| Norway | 37 | O |
| United States | 36 | O |
| Slovenia | 31 | ▼ |
| Moldova, Republic of | 30 | ▼ |
| Iran, Islamic Republic of | 27 | ▼ |
| Cyprus | 22 | ▼ |
| Belgium (Flemish) | 21 | ▼ |
| Morocco | 20 | ▼ |
| Philippines | 17 | ▼ |
| Tunisia | 16 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | A |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| PHYSICAL SCIENCE | Classification and Composition of Matter | Conceptual Understanding |

## What strong magnets separate

A strong magnet will separate a mixture of

Ⓐ clear glass and green glass.

Ⓑ paper cups and plastic cups.

Ⓒ iron nails and aluminum nails.

Ⓓ sand and salt.

*Item Number: S011006*

**Overall Percent Correct**

| | | |
|---|---|---|
| Japan | 86 | ▲ |
| Netherlands | 85 | ▲ |
| Russian Federation | 85 | ▲ |
| Cyprus | 83 | ▲ |
| Iran, Islamic Republic of | 82 | ▲ |
| Lithuania | 82 | ▲ |
| Moldova, Republic of | 82 | ▲ |
| England | 82 | ▲ |
| Italy | 81 | ▲ |
| Hungary | 80 | ▲ |
| Chinese Taipei | 79 | ▲ |
| Singapore | 79 | ▲ |
| Armenia | 78 | O |
| Latvia | 76 | O |
| United States | 76 | O |
| Australia | 75 | O |
| **International average** | **75** | |
| Scotland | 73 | O |
| Hong Kong, SAR | 72 | O |
| Slovenia | 72 | O |
| New Zealand | 70 | ▼ |
| Belgium (Flemish) | 67 | ▼ |
| Philippines | 65 | ▼ |
| Norway | 63 | ▼ |
| Tunisia | 56 | ▼ |
| Morocco | 55 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | C |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Classification and Composition of Matter | Factual Knowledge |

## Common substances that dissolve in water

Which of these things will dissolve in water?

Ⓐ iron filings

Ⓑ wood chips

Ⓒ sand

Ⓓ sugar

*Item Number: S031035*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 94 | ▲ |
| Russian Federation | 93 | ▲ |
| Lithuania | 91 | ▲ |
| Slovenia | 91 | ▲ |
| Japan | 87 | ▲ |
| Italy | 86 | ▲ |
| Latvia | 85 | ▲ |
| Hong Kong, SAR | 84 | ▲ |
| Hungary | 83 | ▲ |
| Iran, Islamic Republic of | 83 | ▲ |
| England | 81 | ▲ |
| Singapore | 76 | O |
| United States | 76 | O |
| **International average** | **75** | |
| Moldova, Republic of | 74 | O |
| Morocco | 74 | O |
| Scotland | 73 | O |
| Armenia | 72 | O |
| New Zealand | 72 | O |
| Australia | 71 | O |
| Netherlands | 71 | O |
| Belgium (Flemish) | 62 | ▼ |
| Cyprus | 61 | ▼ |
| Norway | 55 | ▼ |
| Philippines | 54 | ▼ |
| Tunisia | 36 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | D |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **A. PHYSICAL SCIENCE** | **Classification and Composition of Matter** | **Factual Knowledge** |
| B. PHYSICAL SCIENCE | Classification and Composition of Matter | Conceptual Understanding |

## Objects made of metals/name

Many objects are made of metals (like copper, iron and gold). This is because metals have many useful properties.

A. Name one object that is made out of metal.

B. What property of the metal makes it useful for this object?

*Item Number: S031406A*

### Overall Percent Correct

| | | |
|---|---|---|
| Scotland | 86 | ▲ |
| Singapore | 84 | ▲ |
| England | 84 | ▲ |
| Hungary | 83 | ▲ |
| Lithuania | 83 | ▲ |
| New Zealand | 83 | ▲ |
| Australia | 80 | ▲ |
| Belgium (Flemish) | 80 | ▲ |
| United States | 79 | ▲ |
| Japan | 78 | ▲ |
| Latvia | 78 | ▲ |
| Slovenia | 78 | ▲ |
| Netherlands | 74 | ▲ |
| Chinese Taipei | 73 | ▲ |
| Russian Federation | 71 | ▲ |
| Hong Kong, SAR | 69 | O |
| Moldova, Republic of | 68 | O |
| **International average** | **65** | |
| Italy | 62 | O |
| Cyprus | 57 | ▼ |
| Norway | 50 | ▼ |
| Armenia | 40 | ▼ |
| Iran, Islamic Republic of | 39 | ▼ |
| Philippines | 23 | ▼ |
| Tunisia | 22 | ▼ |
| Morocco | 5 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

## SCORING

### Correct Response

- Names an object made of metal.
  *Examples: Jewelry, money, electrical wires, magnet, pots/pans, cans, building materials (bridges, beams in buildings, steel rods), boats, cars, etc.*
- Other correct

### Incorrect Response

- Only gives the name of a type of metal.
  *Examples: Copper, silver.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

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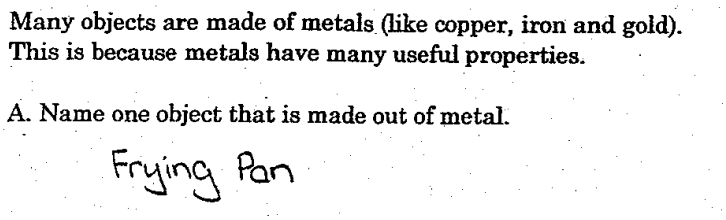
## Objects made of metals/name (continued)

*Item Number: S031406A*

# Student Responses

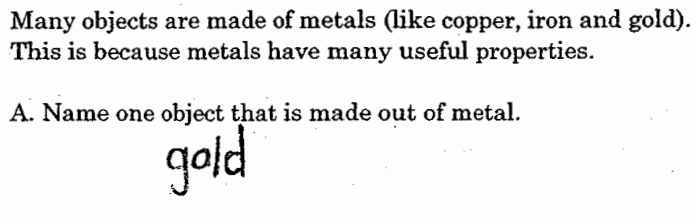
### Correct Response:


Many objects are made of metals (like copper, iron and gold).
This is because metals have many useful properties.

A. Name one object that is made out of metal.

Frying Pan

### Incorrect Response:


Many objects are made of metals (like copper, iron and gold).
This is because metals have many useful properties.

A. Name one object that is made out of metal.

gold

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| A. PHYSICAL SCIENCE | Classification and Composition of Matter | Factual Knowledge |
| **B. PHYSICAL SCIENCE** | **Classification and Composition of Matter** | **Conceptual Understanding** |

## Objects made of metals/property

Many objects are made of metals (like copper, iron and gold). This is because metals have many useful properties.

A. Name one object that is made out of metal.

B. What property of the metal makes it useful for this object?

*Item Number: S031406B*

### Overall Percent Correct

| | | |
|---|---|---|
| Lithuania | 45 | ▲ |
| Hungary | 38 | ▲ |
| Singapore | 38 | ▲ |
| Chinese Taipei | 33 | ▲ |
| Japan | 28 | ▲ |
| Russian Federation | 28 | ▲ |
| England | 27 | ▲ |
| **International average** | **19** | |
| Australia | 18 | O |
| Hong Kong, SAR | 18 | O |
| Latvia | 18 | O |
| New Zealand | 18 | O |
| Cyprus | 15 | ▼ |
| Belgium (Flemish) | 15 | ▼ |
| Iran, Islamic Republic of | 14 | ▼ |
| Slovenia | 14 | ▼ |
| United States | 14 | ▼ |
| Scotland | 14 | ▼ |
| Armenia | 13 | ▼ |
| Italy | 13 | ▼ |
| Moldova, Republic of | 13 | ▼ |
| Norway | 11 | ▼ |
| Netherlands | 10 | ▼ |
| Tunisia | 5 | ▼ |
| Philippines | 4 | ▼ |
| Morocco | 2 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

## SCORING

### Correct Response

- Names a correct property of metal that is clearly related to the use of the object named in part A.
  *Examples: It's shiny. (Part A: Bracelet); It conducts heat. (Part A: An Iron)*
  *Magnetic property. (Part A: Compass); Electricity can flow through it. (Part A: Wire)*
  *It can be hammered into thin sheets without breaking. (Part A: Kitchen foil)*
  *It is strong and will not break. (Part A: Pole)*
- Other correct

### Incorrect Response

- Names only a type of metal that the object in Part A is made of. [No property identified.]
  *Examples: Silver (Part A: Bracelet); Copper (Part A: Wire); Iron (PartA: Magnet)*
  *Aluminum (Part A: Kitchen foil)*
- Names a use of the object named in Part A instead of a property of metal.
  *Examples: To sit on. (Part A: Desk); To cut with. (Part A: Scissors)*
  *It is used for money. (Part A: Coin)*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

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## Objects made of metals/property (continued)

*Item Number: S031406B*

# Student Responses

### Correct Response:

Many objects are made of metals (like copper, iron and gold). This is because metals have many useful properties.

B. What property of the metal makes it useful for this object?

Heat travels easily through metal, so it makes it easier to cook.

### Incorrect Response:

Many objects are made of metals (like copper, iron and gold). This is because metals have many useful properties.

B. What property of the metal makes it useful for this object?

Heat travels easily through metal, so it makes it easier to cook.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| PHYSICAL SCIENCE | Classification and Composition of Matter | Factual Knowledge |

## True statement for all objects

Which statement is true for all objects?

Ⓐ All objects are shiny.

Ⓑ All objects are hard.

Ⓒ All objects are rough.

Ⓓ All objects have mass.

*Item Number: S031409*

**Overall Percent Correct**

| | | |
|---|---|---|
| Singapore | 90 | ▲ |
| Hungary | 85 | ▲ |
| Hong Kong, SAR | 83 | ▲ |
| Lithuania | 83 | ▲ |
| Chinese Taipei | 82 | ▲ |
| Russian Federation | 81 | ▲ |
| Moldova, Republic of | 77 | ▲ |
| Australia | 75 | ▲ |
| United States | 73 | ▲ |
| Japan | 71 | ▲ |
| England | 70 | ▲ |
| Latvia | 68 | O |
| New Zealand | 67 | O |
| Belgium (Flemish) | 65 | O |
| **International average** | **63** | |
| Italy | 61 | O |
| Cyprus | 59 | O |
| Armenia | 55 | ▼ |
| Iran, Islamic Republic of | 51 | ▼ |
| Netherlands | 50 | ▼ |
| Scotland | 50 | ▼ |
| Philippines | 48 | ▼ |
| Slovenia | 45 | ▼ |
| Norway | 37 | ▼ |
| Morocco | 36 | ▼ |
| Tunisia | 21 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

| Correct Response: | D |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| PHYSICAL SCIENCE | Classification and Composition of Matter | Reasoning and Analysis |

## Identify wood, rock and iron

The properties of three materials are compared in the table below. One of the materials is wood, one is rock and one is iron.

| Property | Material 1 | Material 2 | Material 3 |
|---|---|---|---|
| Sinks in water? | Yes | No | Yes |
| Burns easily? | No | Yes | No |
| Attracted by a magnet? | Yes | No | No |

Identify the three materials by filling in the spaces below.

Wood is material number: _____

Rock is material number: _____

Iron is material number: _____

*Item Number: S031053*

### Overall Percent Correct

| | | |
|---|---|---|
| Singapore | 74 | ▲ |
| Japan | 69 | ▲ |
| Netherlands | 59 | ▲ |
| Hong Kong, SAR | 58 | ▲ |
| England | 53 | ▲ |
| Belgium (Flemish) | 52 | ▲ |
| Chinese Taipei | 48 | ▲ |
| Lithuania | 45 | ▲ |
| Cyprus | 44 | ▲ |
| Latvia | 42 | O |
| Russian Federation | 42 | O |
| Italy | 41 | O |
| Australia | 39 | O |
| United States | 39 | O |
| Scotland | 38 | O |
| **International average** | **38** | |
| New Zealand | 37 | O |
| Hungary | 35 | O |
| Slovenia | 35 | O |
| Norway | 25 | ▼ |
| Tunisia | 15 | ▼ |
| Armenia | 14 | ▼ |
| Philippines | 12 | ▼ |
| Iran, Islamic Republic of | 9 | ▼ |
| Moldova, Republic of | 9 | ▼ |
| Morocco | 7 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

## SCORING

To be fully correct, all three materials must be identified correctly. Partial credit is given if one or two of the substances are identified correctly. If two substances are identified with the same number, neither one can be considered as correct. For example, a response of 2, 1, 1 should be scored as partially correct. A response of 2, 2, 2 should be scored as incorrect.

### Correct Response

- All three materials identified correctly: wood = 2; rock = 3; iron = 1

### Partial Response

- Two materials identified correctly (1 left blank)
- Only **wood** identified correctly (2); rock and iron are blank or reversed
- Only **rock** identified correctly (3); wood and iron are blank or reversed
- Only **iron** identified correctly (1); wood and rock are blank or reversed
- Other partially correct (with at least one material correct)

### Incorrect Response

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

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## Identify wood, rock and iron (continued)

*Item Number: S031053*

# Student Responses

### Correct Response:

The properties of three materials are compared in the table below.
One of the materials is wood, one is rock and one is iron.

| Property | Material 1 | Material 2 | Material 3 |
|---|---|---|---|
| Sinks in water? | Yes | No | Yes |
| Burns easily? | No | Yes | No |
| Attracted by a magnet? | Yes | No | No |

Identify the three materials by filling in the spaces below.

Wood is material number: 2

Rock is material number: 3

Iron is material number: 1

### Partially Correct Response:

The properties of three materials are compared in the table below.
One of the materials is wood, one is rock and one is iron.

| Property | Material 1 | Material 2 | Material 3 |
|---|---|---|---|
| Sinks in water? | Yes | No | Yes |
| Burns easily? | No | Yes | No |
| Attracted by a magnet? | Yes | No | No |

Identify the three materials by filling in the spaces below.

Wood is material number: 2

Rock is material number: 1

Iron is material number: 3

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## Identify wood, rock and iron (continued)

*Item Number: S031053*

# Student Responses (continued)

### Incorrect Response:

The properties of three materials are compared in the table below.
One of the materials is wood, one is rock and one is iron.

| Property | Material 1 | Material 2 | Material 3 |
|---|---|---|---|
| Sinks in water? | Yes | No | Yes |
| Burns easily? | No | Yes | No |
| Attracted by a magnet? | Yes | No | No |

Identify the three materials by filling in the spaces below.

Wood is material number: NO

Rock is material number: Yes

Iron is material number: Yes

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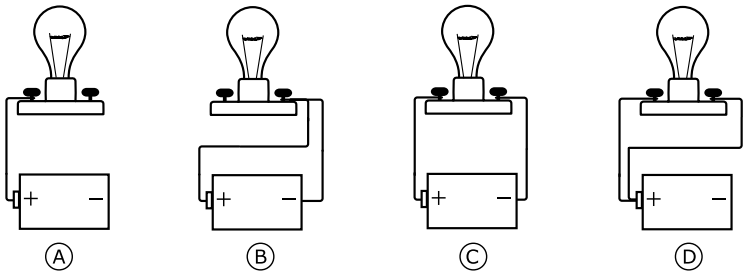
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Electricity and Magnetism | Conceptual Understanding |

## Which bulb will light

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




*Item Number: S031038*

**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 | O |
| Scotland | 78 | O |
| Russian Federation | 77 | O |
| Italy | 76 | O |
| Moldova, Republic of | 75 | O |
| Belgium (Flemish) | 75 | O |
| **International average** | **75** | |
| Hungary | 74 | O |
| Norway | 72 | O |
| Philippines | 72 | O |
| Netherlands | 66 | ▼ |
| Iran, Islamic Republic of | 65 | ▼ |
| Armenia | 53 | ▼ |
| Tunisia | 37 | ▼ |
| Morocco | 31 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | C |
|---|---|

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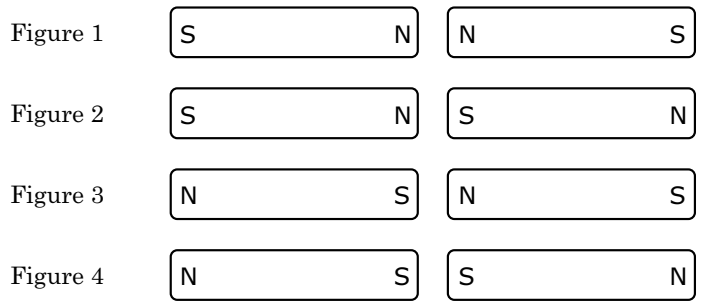
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Electricity and Magnetism | Conceptual Understanding |

## Figure where two magnets repel




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

Ⓐ Figures 1 and 3

Ⓑ Figures 2 and 3

Ⓒ Figures 1 and 4

Ⓓ Figures 1, 2, 3, and 4

*Item Number: S031306*

**Overall Percent Correct**

| | | |
|---|---|---|
| Singapore | 73 | ▲ |
| Japan | 65 | ▲ |
| Chinese Taipei | 62 | ▲ |
| Hong Kong, SAR | 54 | ▲ |
| United States | 50 | ▲ |
| England | 44 | ▲ |
| Russian Federation | 41 | O |
| Netherlands | 40 | O |
| Australia | 39 | O |
| Hungary | 38 | O |
| **International average** | **38** | |
| Armenia | 37 | O |
| Italy | 36 | O |
| Moldova, Republic of | 36 | O |
| 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 O
Lower ▼

| 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 coal furnace heating a house

Ⓑ A windmill pumping water on a farm

Ⓒ A kerosene lamp lighting a room

Ⓓ A diesel truck traveling along a road

*Item Number: S011011*

**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 | O |
| Armenia | 46 | O |
| Lithuania | 45 | O |
| Norway | 45 | O |
| **International average** | **45** | |
| Singapore | 44 | O |
| Scotland | 44 | O |
| 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 O
Lower ▼

| Correct Response: | B |
|---|---|

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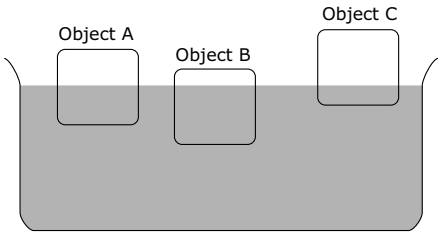
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| PHYSICAL SCIENCE | Forces and Motion | Conceptual Understanding |

## Objects floating in water

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




Which object weighs the most?

Ⓐ Object A

Ⓑ Object B

Ⓒ Object C

Ⓓ They all weigh the same.

*Item Number: S011001*

**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 | O |
| Russian Federation | 85 | O |
| Lithuania | 84 | O |
| **International average** | **83** | |
| Moldova, Republic of | 82 | O |
| Armenia | 72 | ▼ |
| Iran, Islamic Republic of | 70 | ▼ |
| Philippines | 52 | ▼ |
| Morocco | 50 | ▼ |
| Tunisia | 50 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| 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

*Item Number: S031313*

**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 | O |
| Latvia | 41 | O |
| Scotland | 41 | O |
| Italy | 39 | O |
| **International average** | **39** | |
| Netherlands | 37 | O |
| Russian Federation | 37 | O |
| Australia | 35 | O |
| 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 O
Lower ▼

| Correct Response: | B |
|---|---|

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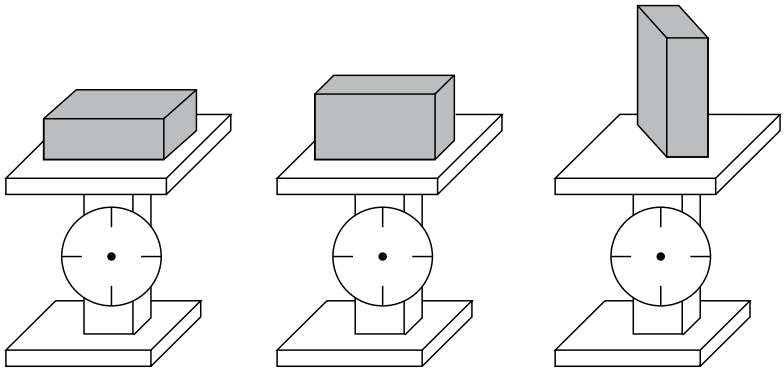
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Forces and Motion | Reasoning and Analysis |

## Weight on scale

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



1. 2. 3.

What will the scale show?

Ⓐ 1 will show the greatest weight.

Ⓑ 2 will show the greatest weight.

Ⓒ 3 will show the greatest weight.

Ⓓ All will show the same weight.

*Item Number: S011009*

**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 | O |
| Armenia | 74 | O |
| Netherlands | 74 | O |
| United States | 73 | O |
| Belgium (Flemish) | 73 | O |
| Iran, Islamic Republic of | 72 | O |
| **International average** | **72** | |
| Hong Kong, SAR | 69 | O |
| 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 O
Lower ▼

| Correct Response: | D |
|---|---|

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| 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?

Ⓐ Copper is a good conductor of heat.

Ⓑ Copper is easy to melt.

Ⓒ Copper is difficult to shape.

Ⓓ Copper dissolves in hot water.

*Item Number: S011014*

**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 | O |
| Italy | 63 | O |
| Belgium (Flemish) | 62 | O |
| **International average** | **62** | |
| Slovenia | 61 | O |
| 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 O
Lower ▼

| Correct Response: | A |
|---|---|

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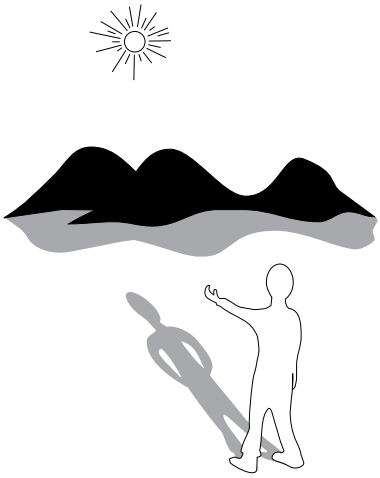
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Light | Conceptual Understanding |

## 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.

*Item Number: S031072*

### Overall Percent Correct

| | | |
|---|---|---|
| Japan | 63 | ▲ |
| Singapore | 48 | ▲ |
| England | 46 | ▲ |
| Hong Kong, SAR | 44 | ▲ |
| Latvia | 39 | ▲ |
| Chinese Taipei | 38 | ▲ |
| Australia | 31 | O |
| Hungary | 31 | ▲ |
| Russian Federation | 31 | ▲ |
| New Zealand | 30 | ▲ |
| United States | 27 | O |
| Belgium (Flemish) | 26 | O |
| **International average** | **25** | |
| Italy | 23 | O |
| Lithuania | 21 | O |
| Cyprus | 20 | O |
| 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 | O |
| Lower | ▼ |

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# 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.*

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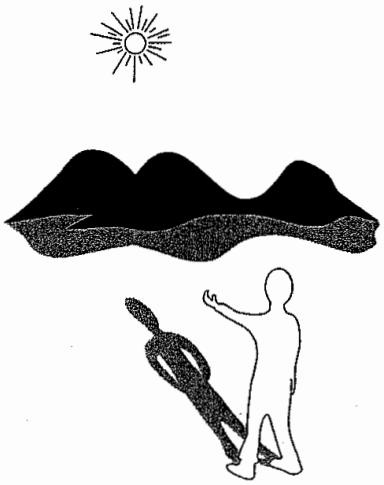
## Two things wrong with the shadow (continued)

*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

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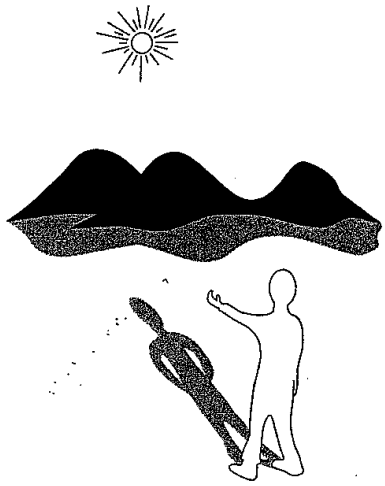
## Two things wrong with the shadow (continued)

*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

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## 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 mountians are wrong

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| 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

*Item Number: S011029*

**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 | O |
| Cyprus | 77 | ▼ |
| Iran, Islamic Republic of | 67 | ▼ |
| Philippines | 62 | ▼ |
| Morocco | 56 | ▼ |
| Tunisia | 49 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| 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

*Item Number: S011017*

**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 | O |
| Australia | 69 | O |
| New Zealand | 67 | O |
| **International average** | **66** | |
| Armenia | 64 | O |
| Chinese Taipei | 64 | O |
| Cyprus | 64 | O |
| Slovenia | 64 | O |
| Belgium (Flemish) | 64 | O |
| 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 O
Lower ▼

**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.

*Item Number: S011030*

**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 | O |
| Norway | 86 | ▲ |
| Belgium (Flemish) | 85 | ▲ |
| Lithuania | 83 | O |
| United States | 82 | O |
| **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 O
Lower ▼

| 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.

*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.*

## 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 | O |
| **International average** | **44** | |
| Cyprus | 41 | O |
| 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 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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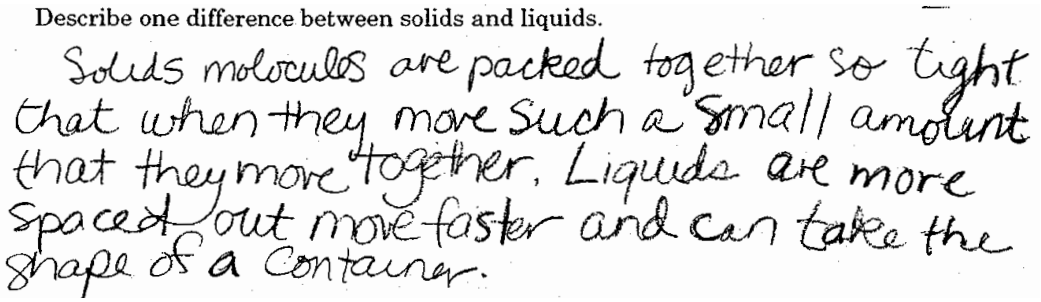
## Difference between solids and liquids (continued)

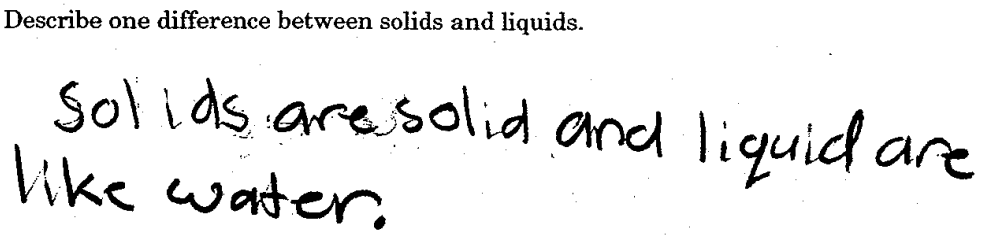
*Item Number: S031370*

# Student Responses

### Correct Response:




### Incorrect Response:

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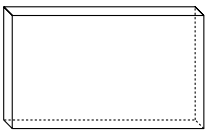
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| PHYSICAL SCIENCE | Physical States and Changes in Matter | Reasoning and Analysis |

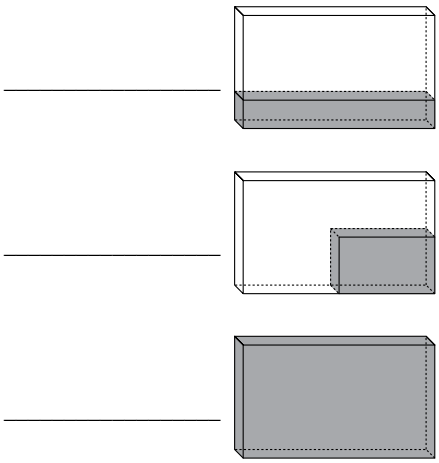
## Solid, liquid, and gas in a container/identify

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 | O |
| Moldova, Republic of | 59 | O |
| **International average** | **57** | |
| Australia | 56 | O |
| Scotland | 55 | O |
| 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 | O |
| Lower | ▼ |

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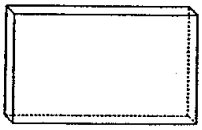
## Solid, liquid, and gas in a container/identify (continued)

*Item Number: S031372A*

# Student Responses

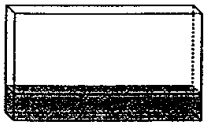
### Correct Response:

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.

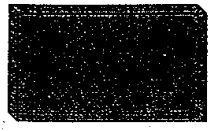


Look at the figures **below**. They show how the different types of material will look when put into the larger box.

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.)

liquid 

Solid

gas 

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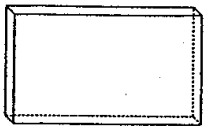
## Solid, liquid, and gas in a container/identify (continued)

*Item Number: S031372A*

# Student Responses (continued)

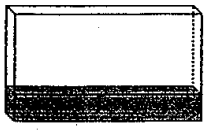
### Incorrect Response:

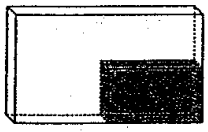
The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.

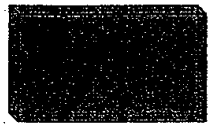


Look at the figures **below**. They show how the different types of material will look when put into the larger box.

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.)

liquid 

solid 

solid 

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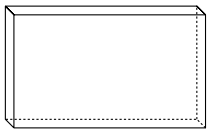
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **PHYSICAL SCIENCE** | Physical States and Changes in Matter | Reasoning and Analysis |

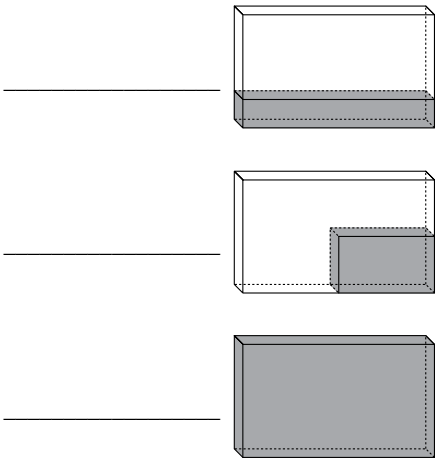
## Solid, liquid, and gas in a container/explain

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.

*Item Number: S031372B*

**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 | O |
| Cyprus | 16 | O |
| **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 | O |
| Lower | ▼ |

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# 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)

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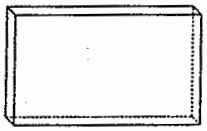
## Solid, liquid, and gas in a container/explain (continued)

*Item Number: S031372B*

# Student Responses

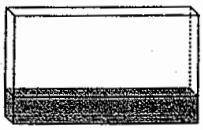
### Correct Response:

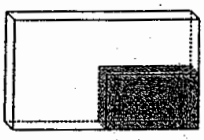
The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.

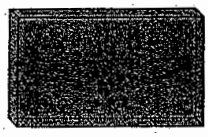


Look at the figures **below**. They show how the different types of material will look when put into the larger box.

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.)

liquid 

solid 

gas 

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.

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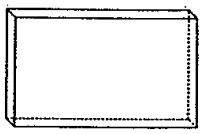
## Solid, liquid, and gas in a container/explain (continued)

*Item Number: S031372B*

## Student Responses (continued)

### Partially Correct Response:

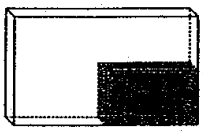
The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.

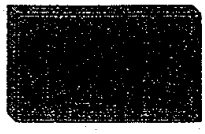


Look at the figures **below**. They show how the different types of material will look when put into the larger box.

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.)

liquid

gas 

Solid 

B. Explain your answers.

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

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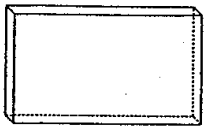
## Solid, liquid, and gas in a container/explain (continued)

*Item Number: S031372B*

# Student Responses (continued)

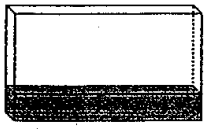
### Incorrect Response:

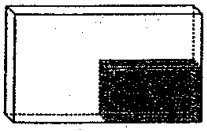
The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.

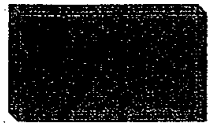


Look at the figures **below**. They show how the different types of material will look when put into the larger box.

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.

Number1, It is a liquid because it is water.
Number2, It is standing stright like solid.
Number3, It is all Solid.

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| 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?

*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 freeeze.*
  *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*

## 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 | O |
| New Zealand | 22 | O |
| Latvia | 21 | O |
| Netherlands | 21 | O |
| Hungary | 19 | O |
| **International average** | **19** | |
| Armenia | 18 | O |
| 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 | O |
| Lower | ▼ |

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## 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 to much carbon dioxied.

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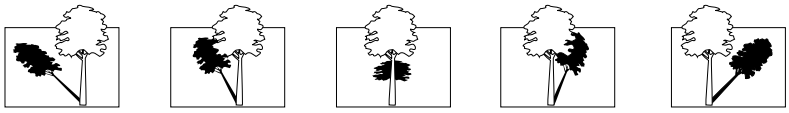
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth in the Solar System and Universe | Conceptual Understanding |

## Which diagram shows shadow

At different times during a sunny day a tree was seen to cast a shadow of different length as shown in the diagrams below. Which diagram shows the shadow at mid-day (12 noon)?



Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

*Item Number: S011027*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 88 | ▲ |
| Hong Kong, SAR | 86 | ▲ |
| Japan | 86 | ▲ |
| Hungary | 83 | ▲ |
| England | 83 | ▲ |
| Lithuania | 78 | ▲ |
| Singapore | 78 | ▲ |
| Italy | 77 | ▲ |
| Australia | 75 | ▲ |
| Latvia | 75 | ▲ |
| Moldova, Republic of | 75 | ▲ |
| New Zealand | 75 | ▲ |
| Belgium (Flemish) | 75 | ▲ |
| Norway | 72 | O |
| Netherlands | 70 | O |
| Slovenia | 70 | O |
| United States | 70 | O |
| **International average** | **70** | |
| Russian Federation | 69 | O |
| Scotland | 69 | O |
| Armenia | 60 | ▼ |
| Philippines | 57 | ▼ |
| Cyprus | 52 | ▼ |
| Iran, Islamic Republic of | 47 | ▼ |
| Tunisia | 42 | ▼ |
| Morocco | 35 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: C**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **EARTH SCIENCE** | Earth in the Solar System and Universe | Factual Knowledge |

## Which is hottest

Which of these is hottest?

Ⓐ The Earth

Ⓑ Mars

Ⓒ The Moon

Ⓓ The Sun

*Item Number: S011018*

**Overall Percent Correct**

| | | |
|---|---|---|
| Norway | 99 | ▲ |
| Latvia | 98 | ▲ |
| Lithuania | 98 | ▲ |
| Moldova, Republic of | 98 | ▲ |
| Russian Federation | 98 | ▲ |
| Scotland | 98 | ▲ |
| Belgium (Flemish) | 98 | ▲ |
| New Zealand | 97 | ▲ |
| Slovenia | 97 | ▲ |
| United States | 97 | ▲ |
| England | 97 | ▲ |
| Australia | 96 | ▲ |
| Hungary | 96 | ▲ |
| Netherlands | 96 | ▲ |
| Singapore | 96 | ▲ |
| Armenia | 92 | O |
| Italy | 92 | O |
| **International average** | **91** | |
| Japan | 90 | O |
| Hong Kong, SAR | 85 | ▼ |
| Iran, Islamic Republic of | 85 | ▼ |
| Cyprus | 83 | ▼ |
| Tunisia | 82 | ▼ |
| Chinese Taipei | 81 | ▼ |
| Morocco | 68 | ▼ |
| Philippines | 68 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | D |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth in the Solar System and Universe | Factual Knowledge |

## Earth's movement

Each year the Earth moves once around

Ⓐ Mars

Ⓑ the Sun

Ⓒ the Moon

Ⓓ all of the other planets

*Item Number: S011022*

**Overall Percent Correct**

| | | |
|---|---|---|
| Russian Federation | 87 | ▲ |
| Latvia | 86 | ▲ |
| Hungary | 84 | ▲ |
| Iran, Islamic Republic of | 84 | ▲ |
| Armenia | 82 | ▲ |
| Lithuania | 80 | ▲ |
| Norway | 80 | ▲ |
| England | 79 | ▲ |
| Moldova, Republic of | 78 | ▲ |
| United States | 74 | ▲ |
| Hong Kong, SAR | 70 | O |
| Australia | 69 | O |
| Belgium (Flemish) | 69 | O |
| Italy | 68 | O |
| **International average** | **67** | |
| New Zealand | 66 | O |
| Scotland | 66 | O |
| Chinese Taipei | 63 | ▼ |
| Netherlands | 62 | ▼ |
| Singapore | 62 | ▼ |
| Slovenia | 60 | ▼ |
| Japan | 58 | ▼ |
| Cyprus | 55 | ▼ |
| Philippines | 46 | ▼ |
| Morocco | 30 | ▼ |
| Tunisia | 29 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: B**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth in the Solar System and Universe | Factual Knowledge |

## How much time to next full moon

Kate sees a full moon. About how much time will go by before the next full moon?

Ⓐ one week

Ⓑ two weeks

Ⓒ one month

Ⓓ one year

*Item Number: S031060*

**Correct Response: C**

### Overall Percent Correct

| | | |
|---|---|---|
| Chinese Taipei | 62 | ▲ |
| Latvia | 47 | ▲ |
| Moldova, Republic of | 46 | ▲ |
| New Zealand | 45 | ▲ |
| Slovenia | 45 | ▲ |
| United States | 43 | ▲ |
| Norway | 40 | O |
| Australia | 39 | O |
| Japan | 38 | O |
| Russian Federation | 38 | O |
| England | 38 | O |
| Hong Kong, SAR | 37 | O |
| Netherlands | 37 | O |
| **International average** | **37** | |
| Singapore | 36 | O |
| Scotland | 36 | O |
| Iran, Islamic Republic of | 34 | O |
| Italy | 34 | O |
| Belgium (Flemish) | 34 | O |
| Philippines | 33 | O |
| Lithuania | 32 | ▼ |
| Armenia | 30 | ▼ |
| Tunisia | 27 | ▼ |
| Cyprus | 26 | ▼ |
| Hungary | 26 | ▼ |
| Morocco | 24 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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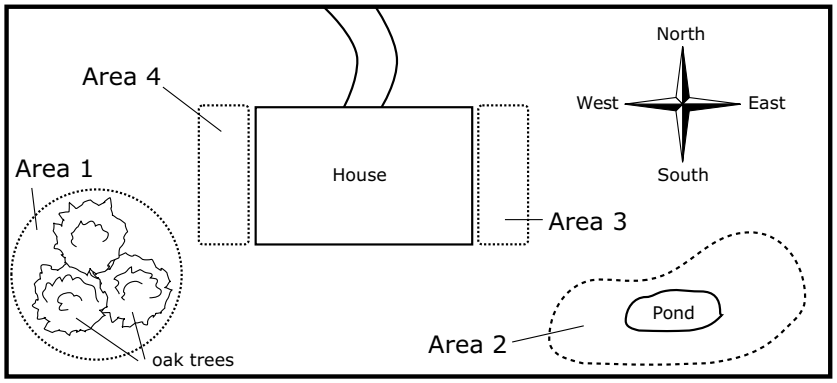
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth in the Solar System and Universe | Reasoning and Analysis |

## Garden: which side of the house gets most sun

A plan of Rebecca's house and garden is shown below. There are four areas in the garden where she would like to grow some plants (Areas 1, 2, 3, and 4).




Which side of Rebecca's house will receive the most sun in the morning?

(Check one box.)

☐ East side (Area 3)

☐ West side (Area 4)

Explain your answer.

*Item Number: S031440*

### Overall Percent Correct

| | | |
|---|---|---|
| Chinese Taipei | 55 | ▲ |
| Hong Kong, SAR | 51 | ▲ |
| Japan | 45 | ▲ |
| Singapore | 42 | ▲ |
| Hungary | 41 | ▲ |
| Latvia | 34 | ▲ |
| Netherlands | 33 | ▲ |
| Italy | 30 | O |
| Slovenia | 30 | O |
| United States | 29 | O |
| Australia | 28 | O |
| Cyprus | 28 | O |
| New Zealand | 27 | O |
| **International average** | **26** | |
| Lithuania | 23 | O |
| Belgium (Flemish) | 22 | O |
| Russian Federation | 21 | ▼ |
| England | 21 | O |
| Moldova, Republic of | 16 | ▼ |
| Norway | 14 | ▼ |
| Iran, Islamic Republic of | 13 | ▼ |
| Scotland | 11 | ▼ |
| Morocco | 10 | ▼ |
| Philippines | 7 | ▼ |
| Tunisia | 7 | ▼ |
| Armenia | 4 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

## SCORING

### Correct Response

- **EAST** with explanation stating that the Sun rises in the East (or similar).
  *Examples: East. The Sun comes up on the East side.*
  *East. The Sun travels from East to West.*
  *East. When the sun comes up on that side it makes a shadow on the west side.*
  *East. Area 4 is shaded in the morning because the Sun in on the East side.*
- Other correct

### Incorrect Response

- **EAST** with no explanation or incorrect explanation. [May include a true statement that does not answer the question.]
  *Examples: East. Because it is closest to the pond.*
  *East. Because it's on the East side.*
  *East. Because the Sun travels across the sky.*
- **WEST** with an explanation stating that the Sun rises in the West (or similar).
  *Examples: West. When the sun rises in the morning it's on the west.*
- **WEST** with no explanation or other incorrect explanation.
  *Examples: West. The oak trees are there.*
- Other incorrect (including crossed out/erased, stray marks, illegible or off task)

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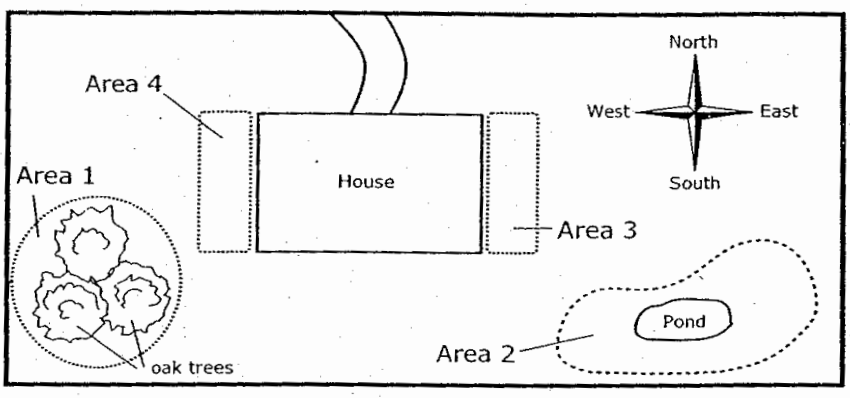
## Garden: which side of the house gets most sun (continued)

*Item Number: S031440*

# Student Responses

### Correct Response:

A plan of Rebecca's house and garden is shown below. There are four areas in the garden where she would like to grow some plants (Areas 1, 2, 3, and 4).




Which side of Rebecca's house will receive the most sun in the morning?

(Check one box.)

☑ East side (Area 3)

☐ West side (Area 4)

Explain your answer.

Area 3 will get the most light because the sun rises in the east and sets in the west.

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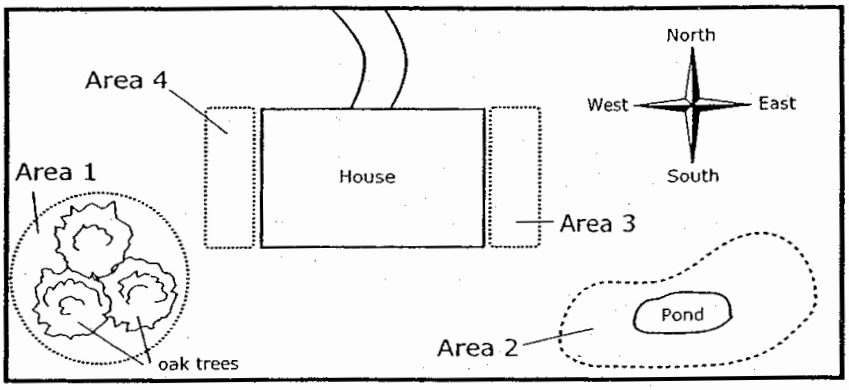
## Garden: which side of the house gets most sun (continued)

*Item Number: S031440*

# Student Responses (continued)

### Incorrect Response:

A plan of Rebecca's house and garden is shown below. There are four areas in the garden where she would like to grow some plants (Areas 1, 2, 3, and 4).




Which side of Rebecca's house will receive the most sun in the morning?

(Check one box.)

☐ East side (Area 3)

☑ West side (Area 4)

Explain your answer.

I choose west side (Area 4) because the sun rises on the west side. That's the side that will get the most sun in the morning.

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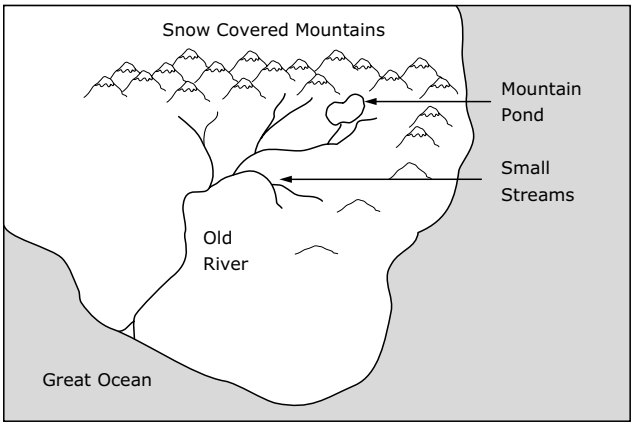
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth Processes, Cycles, and History | Conceptual Understanding |

## Direction of water

Draw an arrow on the Old River to show the direction that the water flows.




*Item Number: S011032*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 64 | ▲ |
| Russian Federation | 64 | ▲ |
| Moldova, Republic of | 62 | ▲ |
| Japan | 58 | ▲ |
| Latvia | 56 | ▲ |
| Netherlands | 54 | ▲ |
| England | 52 | ▲ |
| Italy | 51 | ▲ |
| Singapore | 51 | ▲ |
| Slovenia | 50 | ▲ |
| New Zealand | 49 | ▲ |
| Australia | 48 | O |
| Scotland | 48 | O |
| Cyprus | 47 | O |
| Hong Kong, SAR | 47 | O |
| Norway | 45 | O |
| Hungary | 44 | O |
| **International average** | **44** | |
| Armenia | 42 | O |
| Belgium (Flemish) | 40 | ▼ |
| United States | 37 | ▼ |
| Lithuania | 30 | ▼ |
| Iran, Islamic Republic of | 18 | ▼ |
| Morocco | 14 | ▼ |
| Tunisia | 13 | ▼ |
| Philippines | 12 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

## SCORING

### Correct Response

- Draws an arrow on the diagram that is on river or along the river below the feeder rivers and streams with an arrowhead pointing towards the Great Ocean.
- Other correct

### Incorrect Response

- Draws an arrow pointing the opposite way or a prose description of this direction.
- Draws an arrow that points in any other direction.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

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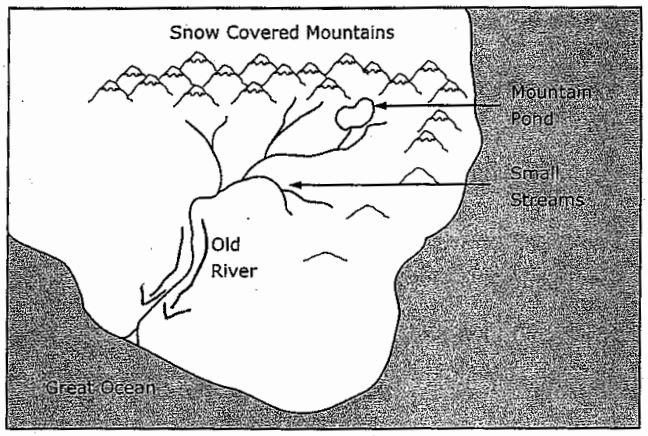
## Direction of water (continued)

*Item Number: S011032*

# Student Responses

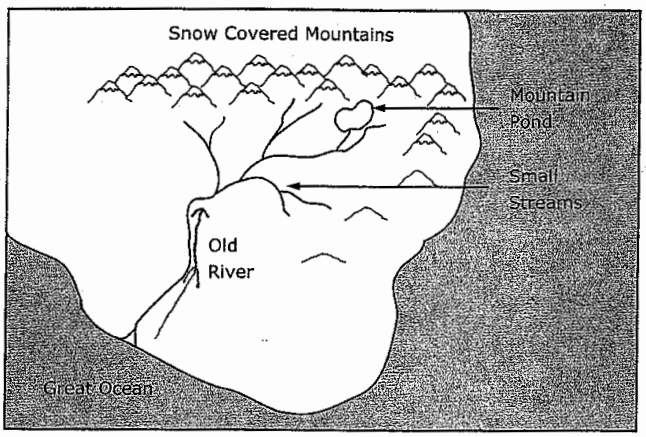
### Correct Response:

Draw an arrow on the Old River to show the direction that the water flows.




### Incorrect Response:

Draw an arrow on the Old River to show the direction that the water flows.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth Processes, Cycles, and History | Conceptual Understanding |

## Water vapor when it gets cold

On a hot, humid day the air contains a lot of water vapor. What happens to the water vapor in the air when the air becomes very cold?

*Item Number: S031382*

## SCORING

### Correct Response

- Refers to **condensation** or **freezing** (or equivalent).
  *Examples: It freezes.*
  *It condenses.*
  *Condensation.*
  *It condenses and turns into rain.*
- Mentions cloud formation or a form of precipitation (e.g., rain, snow, fog, etc.)
  *Examples: The water vapor changes to rain.*
  *It changes to snow.*
  *Water vapor turns into clouds.*
  *It rises into the clouds and becomes rain droplets.*
  *It turns foggy.*
  *It rains.*
- Other correct
  *Examples: It falls to the ground.*

### Incorrect Response

- Mentions only that the water becomes cold. [No mention of a change of state or precipitation.]
  *Examples: The water vapor becomes cold.*
  *Its temperature drops.*
- Mentions only that water vapor rises (or similar). [No mention of condensation or precipitation.]
  *Examples: The water vapor will rise on a hot day.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)
  *Examples: It disappears.*

## Overall Percent Correct

| | | |
|---|---|---|
| Netherlands | 72 | ▲ |
| Singapore | 68 | ▲ |
| Belgium (Flemish) | 67 | ▲ |
| Hungary | 65 | ▲ |
| Latvia | 60 | ▲ |
| United States | 58 | ▲ |
| Chinese Taipei | 57 | ▲ |
| Russian Federation | 55 | ▲ |
| England | 54 | ▲ |
| Australia | 53 | ▲ |
| Italy | 49 | O |
| Norway | 49 | O |
| Moldova, Republic of | 48 | O |
| New Zealand | 48 | O |
| Lithuania | 47 | O |
| Scotland | 47 | O |
| **International average** | **47** | |
| Cyprus | 45 | O |
| Japan | 45 | O |
| Slovenia | 43 | O |
| Armenia | 37 | ▼ |
| Hong Kong, SAR | 34 | ▼ |
| Iran, Islamic Republic of | 28 | ▼ |
| Philippines | 20 | ▼ |
| Tunisia | 18 | ▼ |
| Morocco | 12 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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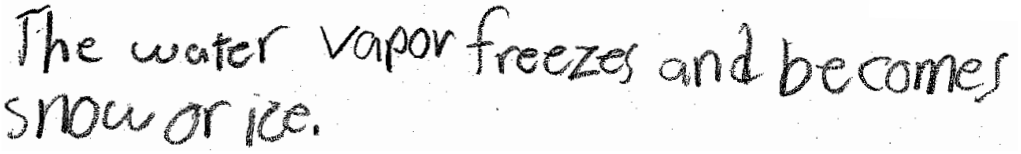
## Water vapor when it gets cold (continued)

*Item Number: S031382*

# Student Responses

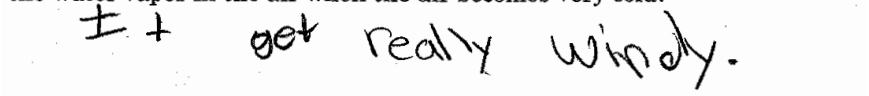
### Correct Response:

On a hot, humid day the air contains a lot of water vapor. What happens to the water vapor in the air when the air becomes very cold?




### Incorrect Response:

On a hot, humid day the air contains a lot of water vapor. What happens to the water vapor in the air when the air becomes very cold?

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth Processes, Cycles, and History | Factual Knowledge |

## Where are fossils found

The fossils of dinosaurs that lived millions of years ago can be found in

Ⓐ the water of oceans.
Ⓑ the ice on ponds.
Ⓒ the trunks of trees.
Ⓓ rocks in the ground.

*Item Number: S011005*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 93 | ▲ |
| Japan | 90 | ▲ |
| Australia | 89 | ▲ |
| Hong Kong, SAR | 89 | ▲ |
| United States | 89 | ▲ |
| Latvia | 88 | ▲ |
| Lithuania | 88 | ▲ |
| Slovenia | 88 | ▲ |
| Netherlands | 87 | ▲ |
| New Zealand | 87 | ▲ |
| England | 87 | ▲ |
| Singapore | 86 | ▲ |
| Belgium (Flemish) | 86 | ▲ |
| Hungary | 85 | ▲ |
| Russian Federation | 85 | ▲ |
| Scotland | 85 | ▲ |
| Italy | 79 | O |
| **International average** | **76** | |
| Cyprus | 75 | O |
| Norway | 75 | O |
| Moldova, Republic of | 64 | ▼ |
| Armenia | 59 | ▼ |
| Iran, Islamic Republic of | 43 | ▼ |
| Philippines | 34 | ▼ |
| Tunisia | 34 | ▼ |
| Morocco | 28 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: D**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth Processes, Cycles, and History | Reasoning and Analysis |

## Town where it is most likely to snow

| | Clouds in the Sky | Lowest Temperature | Highest Temperature |
|---|---|---|---|
| **Town A** | no | 10°C | 25°C |
| **Town B** | yes | 20°C | 30°C |
| **Town C** | no | -10°C | -1°C |
| **Town D** | yes | -15°C | 5°C |

The table above shows some weather information for four different towns during a 24-hour period. In which town did it most likely snow?

Ⓐ Town A
Ⓑ Town B
Ⓒ Town C
Ⓓ Town D

*Item Number: S031383*

**Overall Percent Correct**

| | | |
|---|---|---|
| Belgium (Flemish) | 57 | ▲ |
| Japan | 56 | ▲ |
| Hungary | 54 | ▲ |
| Netherlands | 54 | ▲ |
| England | 49 | ▲ |
| Slovenia | 43 | ▲ |
| Cyprus | 40 | ▲ |
| Latvia | 40 | O |
| United States | 40 | ▲ |
| Italy | 39 | O |
| Lithuania | 38 | O |
| Norway | 37 | O |
| Russian Federation | 37 | O |
| Australia | 36 | O |
| New Zealand | 36 | O |
| **International average** | **36** | |
| Singapore | 35 | O |
| Chinese Taipei | 34 | O |
| Scotland | 34 | O |
| Moldova, Republic of | 32 | O |
| Hong Kong, SAR | 31 | ▼ |
| Armenia | 19 | ▼ |
| Iran, Islamic Republic of | 16 | ▼ |
| Tunisia | 13 | ▼ |
| Philippines | 12 | ▼ |
| Morocco | 9 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: D**

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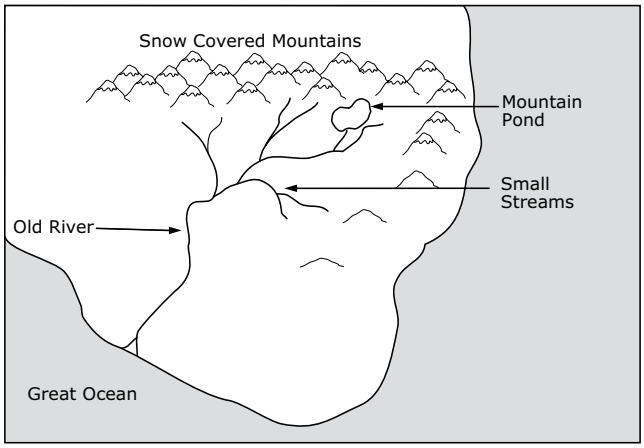
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Conceptual Understanding |

## Saltiest water

Look at this diagram.




The saltiest water is in the

Ⓐ Great Ocean
Ⓑ Mountain Pond
Ⓒ Old River
Ⓓ Small Streams

*Item Number: S011007*

**Overall Percent Correct**

| | | |
|---|---|---|
| Italy | 95 | ▲ |
| Chinese Taipei | 94 | ▲ |
| Japan | 91 | ▲ |
| Cyprus | 87 | ▲ |
| Slovenia | 85 | ▲ |
| Hungary | 82 | ▲ |
| Latvia | 82 | ▲ |
| United States | 82 | ▲ |
| Russian Federation | 81 | ▲ |
| England | 81 | ▲ |
| Norway | 80 | ▲ |
| Belgium (Flemish) | 80 | ▲ |
| Scotland | 79 | ▲ |
| Moldova, Republic of | 76 | O |
| Netherlands | 76 | O |
| Australia | 74 | O |
| New Zealand | 73 | O |
| **International average** | **73** | |
| Hong Kong, SAR | 71 | O |
| Armenia | 65 | ▼ |
| Lithuania | 65 | ▼ |
| Singapore | 63 | ▼ |
| Iran, Islamic Republic of | 47 | ▼ |
| Philippines | 43 | ▼ |
| Morocco | 37 | ▼ |
| Tunisia | 23 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: A**

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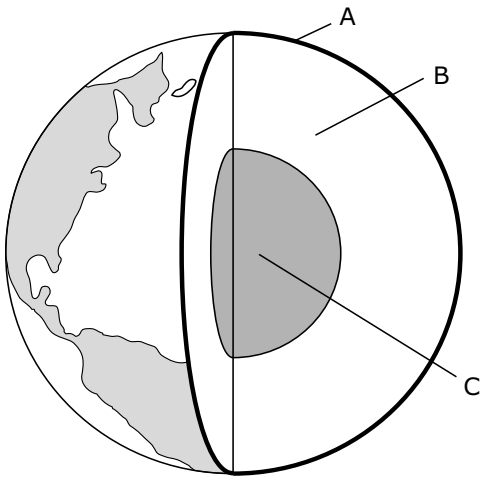
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Conceptual Understanding |

## Layers of Earth

The picture shows the three main layers of the Earth.




Where is it the hottest?

Ⓐ Layer A

Ⓑ Layer B

Ⓒ Layer C

Ⓓ All three layers are the same temperature.

*Item Number: S012007*

**Overall Percent Correct**

| | | |
|---|---|---|
| United States | 90 | ▲ |
| Italy | 89 | ▲ |
| Netherlands | 88 | ▲ |
| New Zealand | 87 | ▲ |
| Hong Kong, SAR | 86 | ▲ |
| England | 86 | ▲ |
| Moldova, Republic of | 84 | ▲ |
| Scotland | 84 | ▲ |
| Norway | 83 | ▲ |
| Hungary | 81 | ▲ |
| Slovenia | 81 | ▲ |
| Belgium (Flemish) | 81 | ▲ |
| Australia | 80 | ▲ |
| Latvia | 80 | ▲ |
| Japan | 79 | ▲ |
| Chinese Taipei | 78 | O |
| Singapore | 76 | O |
| **International average** | **76** | |
| Lithuania | 75 | O |
| Cyprus | 73 | O |
| Russian Federation | 70 | ▼ |
| Armenia | 65 | ▼ |
| Morocco | 52 | ▼ |
| Iran, Islamic Republic of | 51 | ▼ |
| Philippines | 48 | ▼ |
| Tunisia | 47 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: C**

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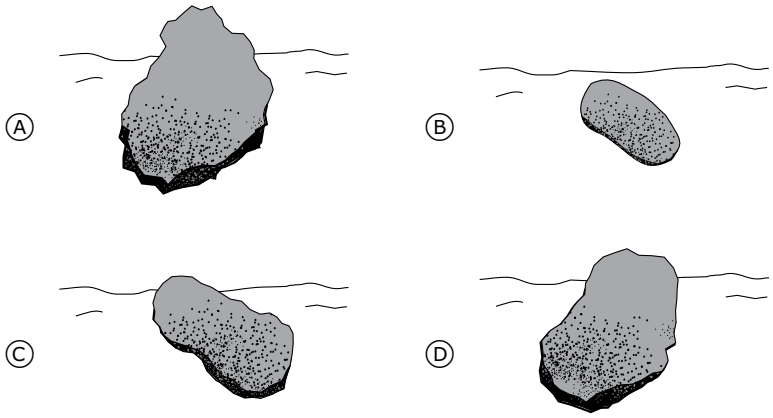
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Conceptual Understanding |

## Rock carried farthest down the river

Lily found four rocks of the same material in a riverbed. They had different shapes and sizes.

Which rock has most likely been carried the farthest down the river?




*Item Number: S031082*

**Overall Percent Correct**

| | | |
|---|---|---|
| Hungary | 86 | ▲ |
| Lithuania | 83 | ▲ |
| Chinese Taipei | 82 | ▲ |
| England | 80 | ▲ |
| Netherlands | 79 | ▲ |
| Russian Federation | 79 | ▲ |
| Belgium (Flemish) | 78 | ▲ |
| Australia | 77 | ▲ |
| Latvia | 76 | ▲ |
| New Zealand | 76 | ▲ |
| United States | 76 | ▲ |
| Italy | 75 | ▲ |
| Moldova, Republic of | 75 | ▲ |
| Cyprus | 73 | O |
| Slovenia | 71 | O |
| Scotland | 70 | O |
| **International average** | **69** | |
| Hong Kong, SAR | 68 | O |
| Japan | 64 | ▼ |
| Norway | 63 | ▼ |
| Armenia | 60 | ▼ |
| Iran, Islamic Republic of | 57 | ▼ |
| Singapore | 57 | ▼ |
| Philippines | 50 | ▼ |
| Morocco | 47 | ▼ |
| Tunisia | 24 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

| Correct Response: | B |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Factual Knowledge |

## Earth's surface

What covers most of the Earth's surface?

Ⓐ Water
Ⓑ Bare rock
Ⓒ Farm land
Ⓓ Cities and towns

*Item Number: S011003*

**Overall Percent Correct**

| | | |
|---|---|---|
| United States | 86 | ▲ |
| Lithuania | 83 | ▲ |
| Russian Federation | 82 | ▲ |
| Singapore | 82 | ▲ |
| England | 82 | ▲ |
| Armenia | 80 | ▲ |
| Latvia | 79 | ▲ |
| Moldova, Republic of | 79 | ▲ |
| Australia | 77 | ▲ |
| Norway | 77 | ▲ |
| Scotland | 77 | ▲ |
| New Zealand | 76 | ▲ |
| Chinese Taipei | 75 | ▲ |
| Hungary | 74 | ▲ |
| Slovenia | 72 | O |
| Hong Kong, SAR | 71 | O |
| Italy | 71 | O |
| **International average** | **68** | |
| Belgium (Flemish) | 65 | O |
| Japan | 60 | ▼ |
| Netherlands | 56 | ▼ |
| Cyprus | 54 | ▼ |
| Philippines | 53 | ▼ |
| Iran, Islamic Republic of | 45 | ▼ |
| Morocco | 30 | ▼ |
| Tunisia | 20 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: A**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Factual Knowledge |

## Gas we need to breathe

What gas in the air do we need to breathe in order to live?

Ⓐ nitrogen
Ⓑ oxygen
Ⓒ carbon dioxide
Ⓓ hydrogen
Ⓔ water vapor

*Item Number: S011012*

**Overall Percent Correct**

| | | |
|---|---|---|
| Hungary | 95 | ▲ |
| Hong Kong, SAR | 94 | ▲ |
| Netherlands | 94 | ▲ |
| Singapore | 94 | ▲ |
| Russian Federation | 93 | ▲ |
| Slovenia | 93 | ▲ |
| Belgium (Flemish) | 93 | ▲ |
| Australia | 91 | ▲ |
| Cyprus | 91 | ▲ |
| Lithuania | 90 | ▲ |
| United States | 90 | ▲ |
| Italy | 89 | ▲ |
| New Zealand | 89 | ▲ |
| England | 89 | ▲ |
| Scotland | 88 | ▲ |
| Chinese Taipei | 85 | O |
| Latvia | 85 | O |
| **International average** | **84** | |
| Norway | 82 | O |
| Iran, Islamic Republic of | 78 | ▼ |
| Moldova, Republic of | 77 | ▼ |
| Japan | 75 | ▼ |
| Armenia | 72 | ▼ |
| Morocco | 62 | ▼ |
| Tunisia | 59 | ▼ |
| Philippines | 53 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | B |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Factual Knowledge |

## Iron and aluminum

Large amounts of metals like iron and aluminum are found in

Ⓐ dead trees
Ⓑ water
Ⓒ animal bones
Ⓓ oil wells
Ⓔ rocks

*Item Number: S011013*

**Correct Response: E**

### Overall Percent Correct

| | | |
|---|---|---|
| Japan | 69 | ▲ |
| Hong Kong, SAR | 65 | ▲ |
| Italy | 64 | ▲ |
| Russian Federation | 58 | ▲ |
| Cyprus | 53 | ▲ |
| Hungary | 51 | ▲ |
| Singapore | 51 | ▲ |
| Chinese Taipei | 48 | O |
| Moldova, Republic of | 48 | O |
| United States | 48 | O |
| Netherlands | 47 | O |
| England | 45 | O |
| **International average** | **45** | |
| Armenia | 44 | O |
| Lithuania | 44 | O |
| New Zealand | 44 | O |
| Belgium (Flemish) | 44 | O |
| Australia | 43 | O |
| Iran, Islamic Republic of | 43 | O |
| Norway | 42 | O |
| Latvia | 40 | ▼ |
| Scotland | 35 | ▼ |
| Philippines | 33 | ▼ |
| Slovenia | 33 | ▼ |
| Morocco | 28 | ▼ |
| Tunisia | 12 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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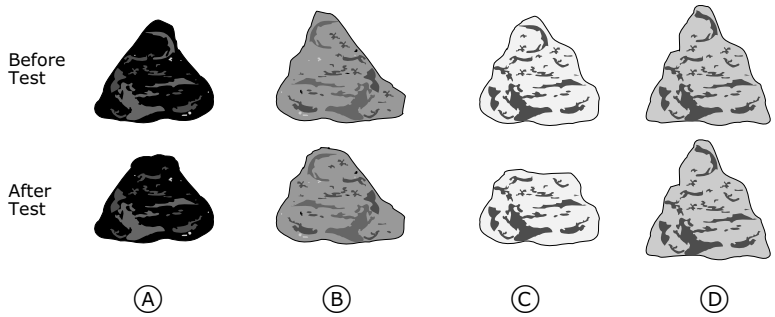
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Reasoning and Analysis |

## Terry's rocks

Terry tested four rocks to see how hard they are. He rubbed each of them against some hard steel for one minute. He drew pictures of what they looked like before he rubbed them and after he rubbed them.

Circle which of Terry's rocks is the hardest.




*Item Number: S011023*

**Correct Response: D**

### Overall Percent Correct

| | | |
|---|---|---|
| Netherlands | 85 | ▲ |
| England | 85 | ▲ |
| United States | 84 | ▲ |
| Hong Kong, SAR | 83 | ▲ |
| Japan | 80 | ▲ |
| Singapore | 80 | ▲ |
| Chinese Taipei | 78 | ▲ |
| Belgium (Flemish) | 78 | ▲ |
| Latvia | 77 | ▲ |
| Slovenia | 74 | ▲ |
| Russian Federation | 72 | ▲ |
| Scotland | 72 | ▲ |
| Australia | 71 | ▲ |
| Italy | 70 | ▲ |
| New Zealand | 70 | ▲ |
| Norway | 68 | O |
| **International average** | **66** | |
| Hungary | 65 | O |
| Cyprus | 64 | O |
| Moldova, Republic of | 61 | O |
| Lithuania | 59 | ▼ |
| Armenia | 47 | ▼ |
| Iran, Islamic Republic of | 38 | ▼ |
| Philippines | 36 | ▼ |
| Morocco | 26 | ▼ |
| Tunisia | 20 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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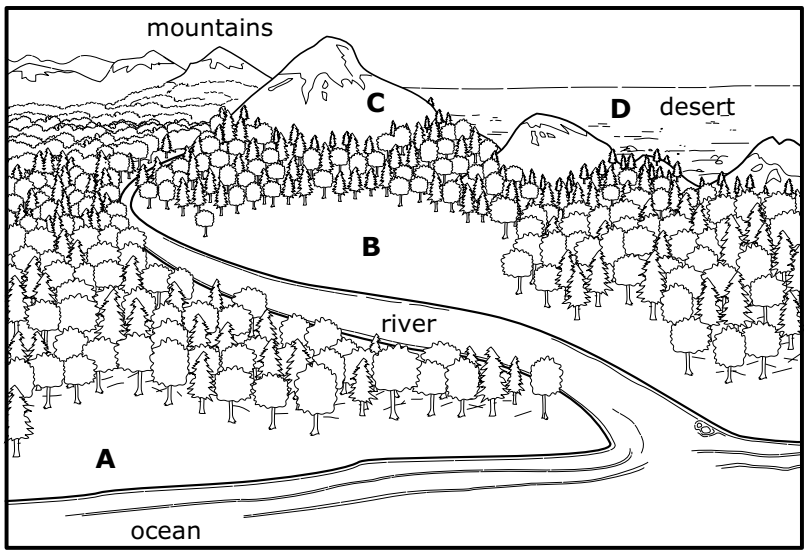
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| EARTH SCIENCE | Earth's Structure and Physical Features | Reasoning and Analysis |

## Best location to grow crops




Look at the picture above. Where is the best location to grow crops?

Ⓐ Location A
Ⓑ Location B
Ⓒ Location C
Ⓓ Location D

*Item Number: S031379*

**Correct Response: B**

### Overall Percent Correct

| | | |
|---|---|---|
| Japan | 75 | ▲ |
| Hong Kong, SAR | 70 | ▲ |
| Latvia | 70 | ▲ |
| United States | 70 | ▲ |
| Hungary | 69 | ▲ |
| Lithuania | 69 | ▲ |
| Netherlands | 69 | ▲ |
| England | 69 | ▲ |
| Italy | 68 | ▲ |
| Scotland | 68 | ▲ |
| Chinese Taipei | 67 | ▲ |
| Australia | 66 | ▲ |
| New Zealand | 63 | ▲ |
| Norway | 63 | ▲ |
| Russian Federation | 63 | ▲ |
| Singapore | 62 | ▲ |
| Cyprus | 59 | O |
| **International average** | **57** | |
| Slovenia | 56 | O |
| Moldova, Republic of | 54 | O |
| Belgium (Flemish) | 44 | ▼ |
| Armenia | 34 | ▼ |
| Iran, Islamic Republic of | 32 | ▼ |
| Morocco | 27 | ▼ |
| Philippines | 24 | ▼ |
| Tunisia | 22 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Changes in Environment | Reasoning and Analysis |

## Plants and fish in river

Write down what happens to plants and fish in a river when a factory pours large amounts of hot water into the river.

*Item Number: S011019*

**Overall Percent Correct**

| | | |
|---|---|---|
| Russian Federation | 90 | ▲ |
| Hong Kong, SAR | 88 | ▲ |
| Japan | 87 | ▲ |
| Singapore | 87 | ▲ |
| Australia | 86 | ▲ |
| Chinese Taipei | 85 | ▲ |
| Latvia | 85 | ▲ |
| United States | 85 | ▲ |
| Netherlands | 84 | ▲ |
| New Zealand | 82 | ▲ |
| Belgium (Flemish) | 82 | ▲ |
| Scotland | 80 | ▲ |
| Slovenia | 79 | ▲ |
| England | 79 | ▲ |
| Cyprus | 78 | ▲ |
| Lithuania | 75 | O |
| Moldova, Republic of | 75 | O |
| **International average** | **73** | |
| Norway | 70 | O |
| Hungary | 69 | O |
| Italy | 69 | O |
| Armenia | 57 | ▼ |
| Tunisia | 43 | ▼ |
| Iran, Islamic Republic of | 40 | ▼ |
| Philippines | 40 | ▼ |
| Morocco | 22 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

## SCORING

### Correct Response

- Explains that some species will die; others will be more abundant.
  *Examples: Fish die, plants grow more because there is more water.*
- Explains that many plants and fishes die.
  *Examples: They die.*
  *They are almost cooked.*
- Explains that fish try to leave.
  *Examples: The fish swim away.*
- Other correct
  *Examples: Fish die, plants live.*

### Incorrect Response

- The description or explanation given is not adequate.
  *Examples: They cannot breathe.*
  *They can do better and do worse.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off tasks)

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## Plants and fish in river (continued)

*Item Number: S011019*

# Student Responses

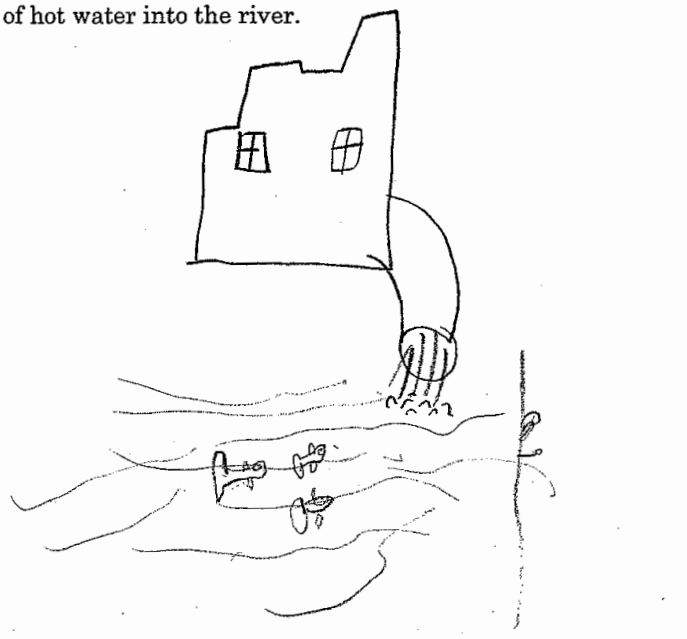
### Correct Response:

Write down what happens to plants and fish in a river when a factory pours large amounts of hot water into the river.

When you put Hot water a fish will Die and plants will grow.

### Incorrect Response:

Write down what happens to plants and fish in a river when a factory pours large amounts of hot water into the river.



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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Use and Conservation of Natural Resources | Factual Knowledge |

## Where we get minerals to make things

Minerals are used for making many things including jewelry, chalk, and concrete. Where do we get the minerals needed to make these things?

Ⓐ from air

Ⓑ from wood

Ⓒ from rocks

Ⓓ from crops

*Item Number: S031398*

**Overall Percent Correct**

| | | |
|---|---|---|
| Hungary | 85 | ▲ |
| Chinese Taipei | 84 | ▲ |
| Russian Federation | 79 | ▲ |
| Japan | 76 | ▲ |
| Italy | 75 | ▲ |
| Latvia | 72 | ▲ |
| Hong Kong, SAR | 67 | ▲ |
| United States | 67 | ▲ |
| Iran, Islamic Republic of | 62 | O |
| Slovenia | 59 | O |
| England | 59 | O |
| **International average** | **59** | |
| Belgium (Flemish) | 58 | O |
| Australia | 57 | O |
| Lithuania | 57 | O |
| Armenia | 52 | ▼ |
| Cyprus | 49 | ▼ |
| Netherlands | 49 | ▼ |
| Scotland | 49 | ▼ |
| Moldova, Republic of | 48 | ▼ |
| Singapore | 48 | ▼ |
| New Zealand | 47 | ▼ |
| Norway | 47 | ▼ |
| Morocco | 46 | ▼ |
| Tunisia | 43 | ▼ |
| Philippines | 30 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | C |
|---|---|

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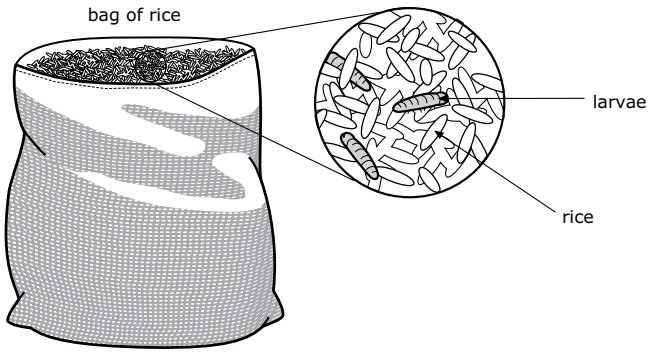
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Development and Life Cycle of Organisms | Conceptual Understanding |

## Larvae found in a bag of rice




Larvae were found in a bag of rice. What best explains how the larvae got there?

Ⓐ They came from water in the bag.

Ⓑ They came from air in the bag.

Ⓒ They came from the rice itself.

Ⓓ They came from eggs laid by insects.

*Item Number: S031003*

**Correct Response: D**

### Overall Percent Correct

| | | |
|---|---|---|
| Lithuania | 91 | ▲ |
| Hungary | 84 | ▲ |
| Latvia | 84 | ▲ |
| Belgium (Flemish) | 81 | ▲ |
| Slovenia | 80 | ▲ |
| Russian Federation | 76 | ▲ |
| Netherlands | 75 | ▲ |
| Australia | 74 | ▲ |
| Chinese Taipei | 73 | ▲ |
| Japan | 73 | ▲ |
| New Zealand | 73 | ▲ |
| England | 73 | ▲ |
| Norway | 72 | ▲ |
| Singapore | 69 | O |
| United States | 69 | O |
| Scotland | 69 | O |
| Moldova, Republic of | 68 | O |
| **International average** | **67** | |
| Hong Kong, SAR | 66 | O |
| Iran, Islamic Republic of | 63 | O |
| Italy | 61 | ▼ |
| Philippines | 52 | ▼ |
| Cyprus | 49 | ▼ |
| Tunisia | 40 | ▼ |
| Armenia | 36 | ▼ |
| Morocco | 31 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Development and Life Cycle of Organisms | Conceptual Understanding |

## Physical change as children become adults

Children grow taller and become heavier as they develop into adults. Describe one other physical change that takes place in children's bodies as they become adults.

*Item Number: S031251*

## SCORING

### Correct Response

- Describes a correct developmental change.
  *Examples: Boys start growing beards.*
  *They start growing hair on their bodies.*
  *Girls start menstruating.*
  *They start developing their sex organs.*
  *Boys voices break and deepen.*
  *Girls hips will widen.*
  *Women get breasts.*
  *They can start having babies.*
- Describes a more general physical change.
  *Examples: They develop muscles and get stronger.*
  *They lose their little teeth and get new bigger teeth.*
- Other correct

### Incorrect Response

- Mentions only that they get smarter or learn more.
  *Examples: They get smarter and smarter.*
  *They learn to read.*
- Mentions only that they grow, get bigger, older, or similar.
  *Examples: They grow up.*
  *Their feet get bigger.*
- Mentions changes that occur after adulthood.
  *Examples: They get gray hair.*
  *They stop growing taller.*
  *They go bald and get wrinkled.*
- Other incorrect (including crossed out/erased, stray marks, illegible or off task).
  *Examples: They look different.*
  *Their personality and attitude changes.*
  *Puberty.*
  *They mature.*

## Overall Percent Correct

| | | |
|---|---|---|
| Japan | 55 | ▲ |
| Chinese Taipei | 47 | ▲ |
| Netherlands | 40 | ▲ |
| England | 37 | ▲ |
| Latvia | 36 | ▲ |
| Russian Federation | 36 | ▲ |
| Italy | 34 | ▲ |
| Norway | 33 | ▲ |
| United States | 33 | ▲ |
| Belgium (Flemish) | 33 | ▲ |
| Singapore | 32 | ▲ |
| Australia | 31 | O |
| Lithuania | 29 | O |
| Hungary | 28 | O |
| Scotland | 28 | O |
| New Zealand | 27 | O |
| **International average** | **27** | |
| Moldova, Republic of | 26 | O |
| Cyprus | 22 | ▼ |
| Slovenia | 17 | ▼ |
| Hong Kong, SAR | 16 | ▼ |
| Armenia | 14 | ▼ |
| Morocco | 10 | ▼ |
| Tunisia | 9 | ▼ |
| Iran, Islamic Republic of | 7 | ▼ |
| Philippines | 6 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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## Physical change as children become adults (continued)

*Item Number: S031251*

# Student Responses

### Correct Response:

Children grow taller and become heavier as they develop into adults. Describe one other physical change that takes place in children's bodies as they become adults.

Their voices change.

### Incorrect Response:

Children grow taller and become heavier as they develop into adults. Describe one other physical change that takes place in children's bodies as they become adults.

Their hands and feet grow larger.

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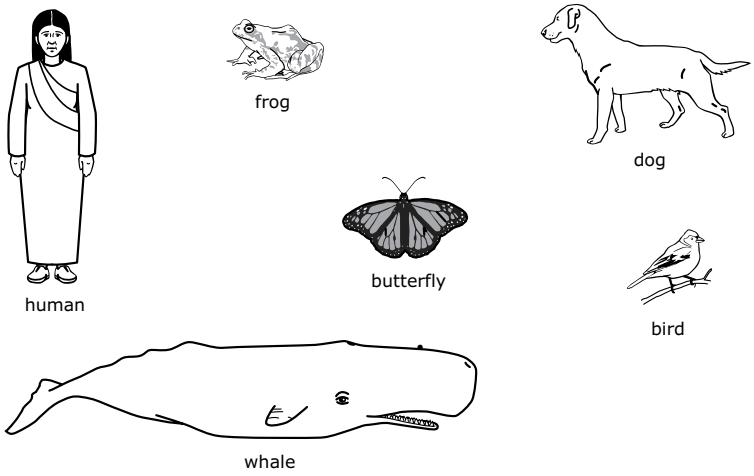
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Development and Life Cycle of Organisms | Conceptual Understanding |

## Organisms that give birth or lay eggs




Some of the organisms shown above give birth to young that develop inside the mother. Some of the organisms have young that hatch from eggs that are laid outside the mother.

In the table below, write down the names of the organisms that belong to each group.

| Organisms that give birth | Organisms that lay eggs |
|---|---|
| | |

*Item Number: S031252*

### Overall Percent Correct

| | | |
|---|---|---|
| Singapore | 84 | ▲ |
| United States | 76 | ▲ |
| New Zealand | 74 | ▲ |
| Netherlands | 73 | ▲ |
| Australia | 72 | ▲ |
| Japan | 67 | ▲ |
| England | 67 | ▲ |
| Italy | 64 | ▲ |
| Russian Federation | 63 | ▲ |
| Belgium (Flemish) | 63 | ▲ |
| Hungary | 62 | ▲ |
| Latvia | 62 | ▲ |
| Lithuania | 60 | O |
| Scotland | 59 | O |
| Hong Kong, SAR | 58 | O |
| Norway | 58 | O |
| **International average** | **58** | |
| Cyprus | 54 | O |
| Chinese Taipei | 53 | ▼ |
| Slovenia | 52 | ▼ |
| Moldova, Republic of | 51 | ▼ |
| Armenia | 46 | ▼ |
| Philippines | 41 | ▼ |
| Iran, Islamic Republic of | 35 | ▼ |
| Morocco | 23 | ▼ |
| Tunisia | 19 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

## SCORING

### Fully Correct Response

- Organisms that give birth: **Human, Dog, Whale**
- Organisms that lay eggs: **Frog, Butterfly, Bird**

### Partially Correct Response

- One organism omitted or misclassified.
- Two organisms omitted or misclassified.

### Incorrect Response

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

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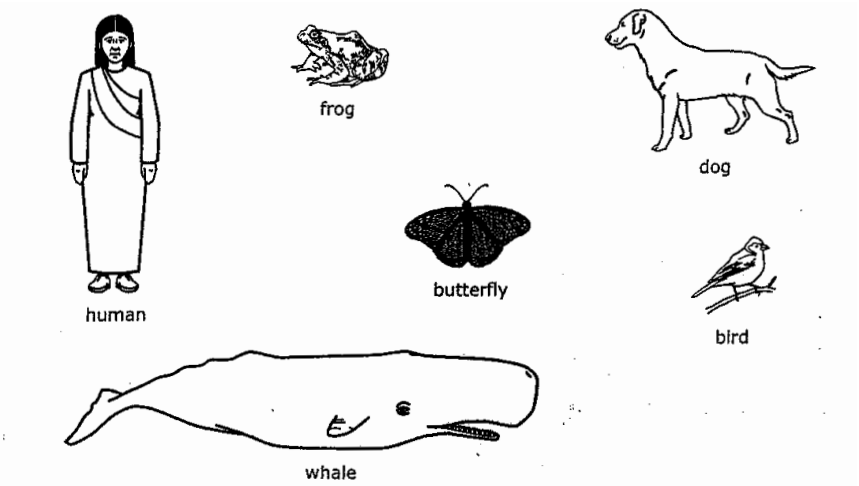
## Organisms that give birth or lay eggs (continued)

*Item Number: S031252*

# Student Responses

### Correct Response:




Some of the organisms shown above give birth to young that develop inside the mother. Some of the organisms have young that hatch from eggs that are laid outside the mother.

In the table below, write down the names of the organisms that belong to each group.

| Organisms that give birth | Organisms that lay eggs |
|---|---|
| human<br>whale<br>dog | frog<br>bird<br>butterfly |

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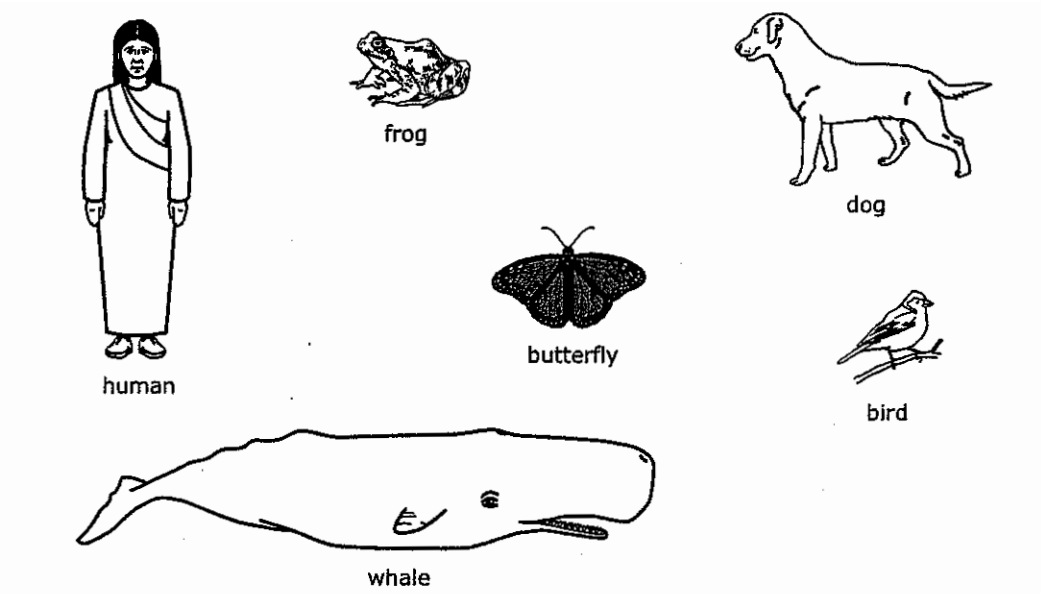
## Organisms that give birth or lay eggs (continued)

*Item Number: S031252*

## Student Responses (continued)

### Partially Correct Response:




Some of the organisms shown above give birth to young that develop inside the mother. Some of the organisms have young that hatch from eggs that are laid outside the mother.

In the table below, write down the names of the organisms that belong to each group.

| Organisms that give birth | Organisms that lay eggs |
|---|---|
| human<br>dog | bird<br>frog<br>whale<br>butterfly |

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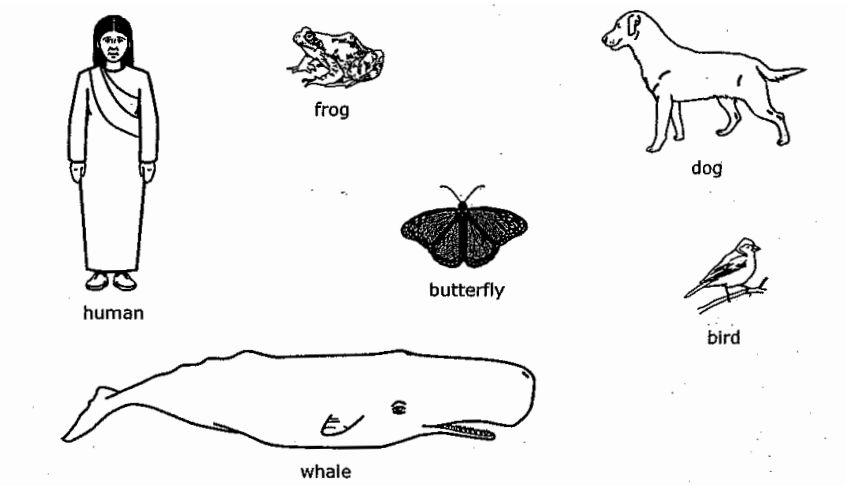
## Organisms that give birth or lay eggs (continued)

*Item Number: S031252*

# Student Responses (continued)

### Incorrect Response:




Some of the organisms shown above give birth to young that develop inside the mother. Some of the organisms have young that hatch from eggs that are laid outside the mother.

In the table below, write down the names of the organisms that belong to each group.

| Organisms that give birth | Organisms that lay eggs |
|---|---|
| They carrie the baby(s) | They do not carie the eggs |

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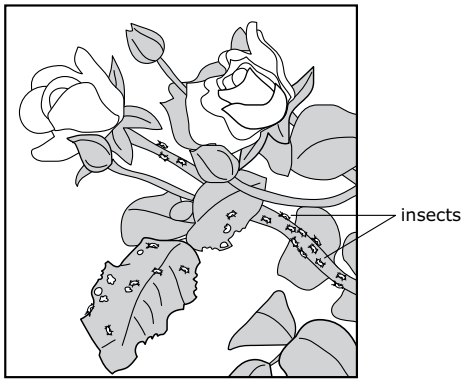
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Development and Life Cycle of Organisms | Conceptual Understanding |

## Garden: why insects are important for flowering plants

Rebecca noticed that the leaves on her rose bushes were getting eaten by insects as shown in the picture below.




Rebecca was planning to use insect spray to kill the insects. Her friend Gwen said that the insect spray might kill other insects that are important for some of the flowering plants in the garden.

Why are some insects important for flowering plants?

*Item Number: S031443*

### Overall Percent Correct

| | | |
|---|---|---|
| Russian Federation | 41 | ▲ |
| Hungary | 39 | ▲ |
| Latvia | 37 | ▲ |
| Netherlands | 33 | ▲ |
| Italy | 28 | ▲ |
| Lithuania | 28 | ▲ |
| United States | 27 | ▲ |
| Australia | 26 | O |
| Chinese Taipei | 24 | O |
| Japan | 24 | O |
| Belgium (Flemish) | 24 | O |
| England | 22 | O |
| Slovenia | 21 | O |
| **International average** | **21** | |
| Hong Kong, SAR | 19 | O |
| New Zealand | 19 | O |
| Singapore | 18 | O |
| Moldova, Republic of | 17 | O |
| Cyprus | 14 | ▼ |
| Iran, Islamic Republic of | 14 | ▼ |
| Armenia | 13 | ▼ |
| Norway | 10 | ▼ |
| Philippines | 10 | ▼ |
| Scotland | 10 | ▼ |
| Morocco | 5 | ▼ |
| Tunisia | 3 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

## SCORING

Note: To receive credit, responses must state a specific benefit to plants. Credit is given both for pollination or reproduction in flowering plants as well as other more general benefits of 'insects' in gardens. Responses that refer to *pollen* but with no or inadequate description of the benefit to plants are scored as incorrect. Specific organisms named (e.g., worms, spiders) do not have to be 'insects' in order to be considered as correct as long as the benefit to plants is correct.

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# Garden: why insects are important for flowering plants (continued)

*Item Number: S031443*

## SCORING (continued)

### Correct Response

- States that some insects (e.g., butterflies, bees) are needed for pollination or reproduction of plants (or similar).
  *Examples: Bees carry the pollen from one flower to another flower.*
  *Some insects are important because plants can't reproduce without them.*
  *They take the pollen to others of the same species.*
  *Bees pollinate the plants.*
- States that some insects eat other insects that are bad for plants (or similar).
  *Examples: They will eat all the bad bugs in the garden.*
  *Some insects are important because they eat other insects.*
  *Spiders and ladybugs will eat the bugs that are killing the plants.*
- Other correct
  *Examples: Worms dig into the soil and bring in air for the plants.*

### Incorrect Response

- Gives only a general/vague response related to insects helping plants with inadequate description.
  *Examples: Some insects are helpful to plants.*
  *They need them to grow.*
- Names a specific insect important to plants but with no specific benefit to plants given.
  *Examples: Bees, ladybugs, butterflies, etc.*
- Refers to pollen but with no or inadequate description of the benefit to plants.
  *Examples: Bees need pollen.*
  *Bees are for pollen.*
  *They produce the right kind of pollen for the plant.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

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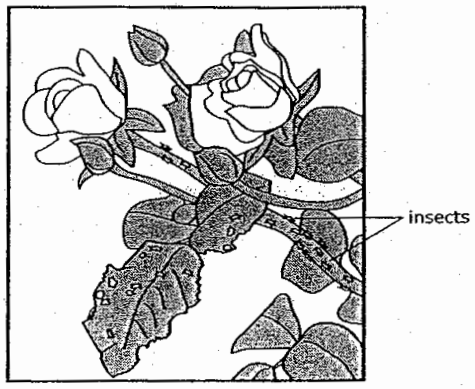
## Garden: why insects are important for flowering plants (continued)

*Item Number: S031443*

# Student Responses

### Correct Response:

Rebecca noticed that the leaves on her rose bushes were getting eaten by insects as shown in the picture below.




Rebecca was planning to use insect spray to kill the insects. Her friend Gwen said that the insect spray might kill other insects that are important for some of the flowering plants in the garden.

Why are some insects important for flowering plants?

Some insects are important because they help polinate flowers

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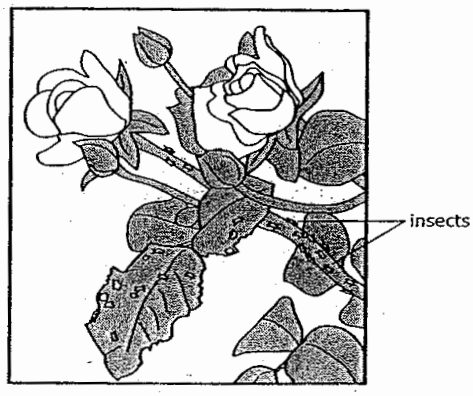
## Garden: why insects are important for flowering plants (continued)

*Item Number: S031443*

# Student Responses (continued)

### Incorrect Response:

Rebecca noticed that the leaves on her rose bushes were getting eaten by insects as shown in the picture below.




Rebecca was planning to use insect spray to kill the insects. Her friend Gwen said that the insect spray might kill other insects that are important for some of the flowering plants in the garden.

Why are some insects important for flowering plants?

Bee's are inportent because they need pollen.

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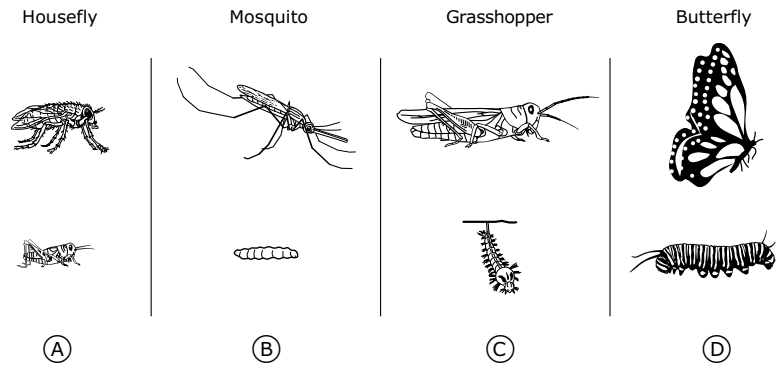
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Development and Life Cycle of Organisms | Factual Knowledge |

## Insect correctly paired with its young form

Which of these insects is correctly paired with its young form?




*Item Number: S031017*

**Overall Percent Correct**

| | | |
|---|---|---|
| United States | 91 | ▲ |
| Singapore | 90 | ▲ |
| Japan | 89 | ▲ |
| Australia | 84 | ▲ |
| England | 84 | ▲ |
| Russian Federation | 82 | ▲ |
| New Zealand | 81 | ▲ |
| Hungary | 80 | ▲ |
| Chinese Taipei | 79 | ▲ |
| Norway | 79 | ▲ |
| Scotland | 78 | O |
| Hong Kong, SAR | 76 | O |
| Belgium (Flemish) | 75 | O |
| Latvia | 74 | O |
| Netherlands | 73 | O |
| **International average** | **73** | |
| Cyprus | 72 | O |
| Italy | 71 | O |
| Moldova, Republic of | 70 | O |
| Slovenia | 69 | O |
| Lithuania | 66 | ▼ |
| Philippines | 62 | ▼ |
| Armenia | 55 | ▼ |
| Iran, Islamic Republic of | 51 | ▼ |
| Tunisia | 26 | ▼ |
| Morocco | 0 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | D |
|---|---|

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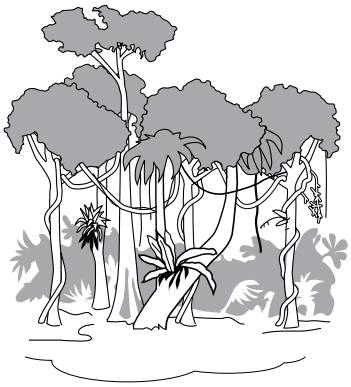
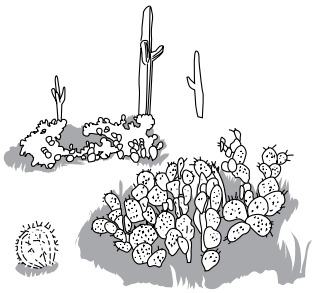
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Diversity, Adaptation, and Natural Selection | Factual Knowledge |

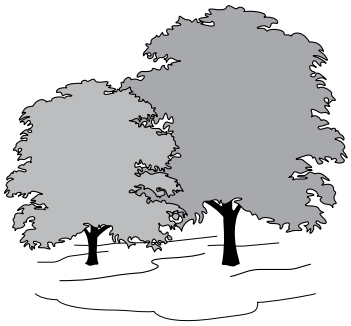
## Plant found in tropical rain forest

Which of these types of plants are usually found growing in a tropical rain forest?

Ⓐ

Ⓑ 

Ⓒ 

Ⓓ 

*Item Number: S031287*

**Overall Percent Correct**

| | | |
|---|---|---|
| Netherlands | 92 | ▲ |
| Hungary | 88 | ▲ |
| United States | 86 | ▲ |
| Latvia | 85 | ▲ |
| Australia | 82 | ▲ |
| Lithuania | 81 | ▲ |
| England | 80 | ▲ |
| Belgium (Flemish) | 80 | ▲ |
| Italy | 79 | ▲ |
| Moldova, Republic of | 77 | ▲ |
| Russian Federation | 73 | ▲ |
| Scotland | 71 | ▲ |
| New Zealand | 70 | ▲ |
| Norway | 67 | ▲ |
| Singapore | 65 | O |
| **International average** | **63** | |
| Chinese Taipei | 62 | O |
| Hong Kong, SAR | 54 | ▼ |
| Slovenia | 47 | ▼ |
| Armenia | 41 | ▼ |
| Japan | 39 | ▼ |
| Philippines | 38 | ▼ |
| Cyprus | 35 | ▼ |
| Iran, Islamic Republic of | 29 | ▼ |
| Morocco | 26 | ▼ |
| Tunisia | 23 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

| Correct Response: | B |
|---|---|

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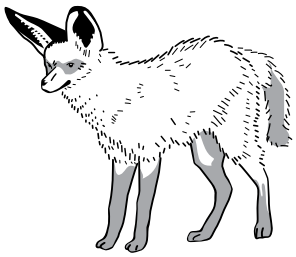
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Diversity, Adaptation, and Natural Selection | Reasoning and Analysis |

## Physical feature to get rid of body heat



Animals usually have physical features that help them live in certain places. Look at the picture shown above. This animal lives in a hot desert.

What physical feature does this animal have that helps it lose heat?

Ⓐ a thick coat of fur

Ⓑ a bushy tail

Ⓒ small eyes

Ⓓ large ears

*Item Number: S031284*

**Overall Percent Correct**

| | | |
|---|---|---|
| Lithuania | 52 | ▲ |
| Latvia | 48 | ▲ |
| Scotland | 48 | ▲ |
| United States | 44 | ▲ |
| England | 44 | ▲ |
| Norway | 41 | ▲ |
| New Zealand | 40 | ▲ |
| Australia | 38 | O |
| Russian Federation | 37 | O |
| Slovenia | 36 | O |
| Japan | 35 | O |
| Belgium (Flemish) | 35 | O |
| Netherlands | 34 | O |
| **International average** | **33** | |
| Chinese Taipei | 29 | ▼ |
| Morocco | 29 | O |
| Hong Kong, SAR | 28 | ▼ |
| Cyprus | 23 | ▼ |
| Singapore | 23 | ▼ |
| Philippines | 22 | ▼ |
| Armenia | 20 | ▼ |
| Italy | 18 | ▼ |
| Tunisia | 18 | ▼ |
| Iran, Islamic Republic of | 12 | ▼ |
| Hungary | 0 | ▼ |
| Moldova, Republic of | 0 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: D**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **A. LIFE SCIENCE**<br>B. LIFE SCIENCE | **Ecosystems**<br>Types, Characteristics, and Classification of Living Things | **Conceptual Understanding**<br>Factual Knowledge |

## Garden: why plants need light to grow

Rebecca moved into a new house. She wanted to grow plants in different areas of her garden.

A. Rebecca knows that plants need light to grow.
Why do plants need light to grow?

B. Plants also need water to grow.
Name one other thing plants need in order to grow well.

*Item Number: S031439A*

## SCORING

### Correct Response

- States that plants need light in order undergo photosynthesis OR make their own food (or similar).
  *Examples: Plants make food using light.*
  *It's for photosynthesis.*
  *They won't make food if there is no light.*
  *To make food*
  *Sunlight gives them food.*
  *Plants get their food using sunlight.*
- States that plants need light for energy (or similar).
  *Examples: Sunlight is the source of energy for all living things.*
  *The Sun warms the plant and gives it energy.*
  *They turn the Sun's rays into energy.*
  *Plants get energy from the Sun.*
- Other correct

### Incorrect Response

Gives only a general response related to plants needing light in order to live/grow (given in the stem).
*Examples: Plants will wilt and die without light.*
*They cannot grow without it.*
*To live.*
*Light makes it grow.*

- Mentions **only** the need for heat/warmth. [No mention of energy.]
  *Examples: The heat from the sun helps them grow.*
  *Living things need warmth.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

## Overall Percent Correct

| | | |
|---|---|---|
| Singapore | 69 | ▲ |
| Hong Kong, SAR | 40 | ▲ |
| Chinese Taipei | 32 | ▲ |
| Italy | 28 | ▲ |
| United States | 25 | ▲ |
| Hungary | 20 | O |
| Moldova, Republic of | 20 | O |
| England | 20 | O |
| **International average** | **16** | |
| Iran, Islamic Republic of | 15 | O |
| Armenia | 14 | O |
| Japan | 13 | ▼ |
| Latvia | 13 | O |
| Netherlands | 12 | ▼ |
| Lithuania | 11 | ▼ |
| Philippines | 11 | ▼ |
| Australia | 10 | ▼ |
| Cyprus | 9 | ▼ |
| Russian Federation | 9 | ▼ |
| New Zealand | 8 | ▼ |
| Norway | 7 | ▼ |
| Slovenia | 6 | ▼ |
| Scotland | 6 | ▼ |
| Belgium (Flemish) | 6 | ▼ |
| Tunisia | 5 | ▼ |
| Morocco | 3 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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## Garden: why plants need light to grow (continued)

*Item Number: S031439A*

# Student Responses

### Correct Response:

Rebecca moved into a new house. She wanted to grow plants in different areas of her garden.

A. Rebecca knows that plants need light to grow.
Why do plants need light to grow?

### Incorrect Response:

Rebecca moved into a new house. She wanted to grow plants in different areas of her garden.

A. Rebecca knows that plants need light to grow.
Why do plants need light to grow?

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| A. LIFE SCIENCE<br>**B. LIFE SCIENCE** | Ecosystems<br>**Types, Characteristics, and Classification of Living Things** | Conceptual Understanding<br>**Factual Knowledge** |

## Garden: one other thing plants need to grow

Rebecca moved into a new house. She wanted to grow plants in different areas of her garden.

A. Rebecca knows that plants need light to grow.
Why do plants need light to grow?

B. Plants also need water to grow.
Name one other thing plants need in order to grow well.

*Item Number: S031439B*

## SCORING

**Correct Response**

- States fertilizer, nutrients, minerals, plant 'food' (or similar term meaning nutrients).
- States air (oxygen or carbon dioxide).
- States soil, dirt, earth (or similar).
- States proper temperature (heat, warmth, etc.).
- Other correct

**Incorrect Response**

- Repeats light, sunlight or Sun.
- Repeats water, moisture or similar.
- Other incorrect (including crossed out/erased, stray marks, illegible or off task)

## Overall Percent Correct

| | | |
|---|---|---|
| Japan | 67 | ▲ |
| Singapore | 66 | ▲ |
| Netherlands | 64 | ▲ |
| England | 64 | ▲ |
| United States | 61 | ▲ |
| Hungary | 57 | ▲ |
| Latvia | 57 | ▲ |
| Australia | 55 | ▲ |
| Chinese Taipei | 51 | ▲ |
| Iran, Islamic Republic of | 50 | O |
| Slovenia | 50 | O |
| Scotland | 49 | O |
| Hong Kong, SAR | 48 | O |
| New Zealand | 48 | O |
| Italy | 45 | O |
| **International average** | **45** | |
| Russian Federation | 43 | O |
| Belgium (Flemish) | 42 | O |
| Norway | 38 | ▼ |
| Lithuania | 35 | ▼ |
| Cyprus | 32 | ▼ |
| Moldova, Republic of | 30 | ▼ |
| Tunisia | 27 | ▼ |
| Armenia | 22 | ▼ |
| Philippines | 15 | ▼ |
| Morocco | 11 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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## Garden: one other thing plants need to grow (continued)

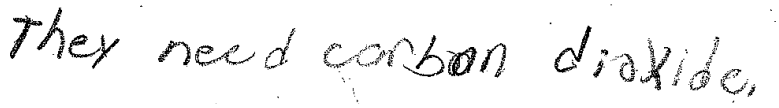
*Item Number: S031439B*

# Student Responses

### Correct Response:

Rebecca moved into a new house. She wanted to grow plants in different areas of her garden.

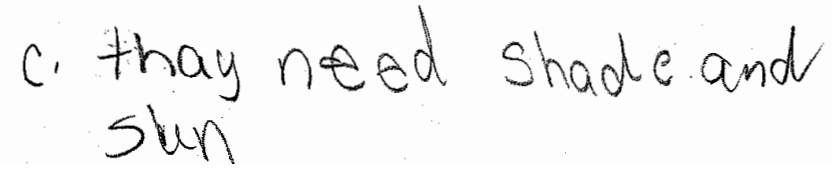
B. Plants also need water to grow.
Name one other thing plants need in order to grow well.




### Incorrect Response:

Rebecca moved into a new house. She wanted to grow plants in different areas of her garden.

B. Plants also need water to grow.
Name one other thing plants need in order to grow well.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Ecosystems | Factual Knowledge |

## Herbivorous animal

Which animal eats only plants?

Ⓐ Cat
Ⓑ Dog
Ⓒ Lion
Ⓓ Rabbit

*Item Number: S011010*

**Overall Percent Correct**

| | | |
|---|---|---|
| Hungary | 99 | ▲ |
| Latvia | 98 | ▲ |
| Russian Federation | 98 | ▲ |
| Lithuania | 97 | ▲ |
| Chinese Taipei | 95 | ▲ |
| Hong Kong, SAR | 95 | ▲ |
| Italy | 95 | ▲ |
| Singapore | 95 | ▲ |
| Armenia | 94 | O |
| Cyprus | 94 | ▲ |
| Netherlands | 94 | O |
| New Zealand | 94 | O |
| Slovenia | 94 | O |
| United States | 94 | ▲ |
| Australia | 92 | O |
| Norway | 92 | O |
| England | 92 | O |
| Belgium (Flemish) | 92 | O |
| **International average** | **92** | |
| Moldova, Republic of | 91 | O |
| Japan | 90 | ▼ |
| Scotland | 90 | ▼ |
| Iran, Islamic Republic of | 88 | ▼ |
| Morocco | 82 | ▼ |
| Tunisia | 82 | ▼ |
| Philippines | 77 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | D |
|---|---|

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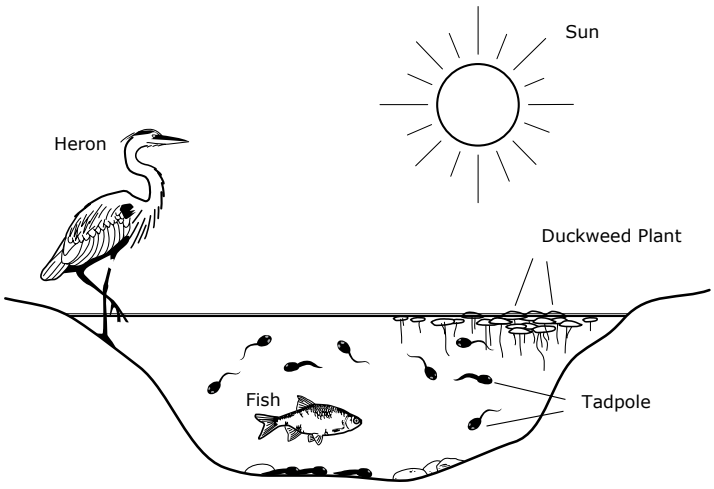
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Ecosystems | Factual Knowledge |

## Where tadpole gets its food




The picture above shows a pond and some of the organisms that live in and around the pond. They all depend on each other for food. The tadpole most likely gets its food from which of the following?

Ⓐ sun

Ⓑ fish

Ⓒ duckweed plant

Ⓓ heron

*Item Number: S031338*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 90 | ▲ |
| Japan | 87 | ▲ |
| Italy | 84 | ▲ |
| Belgium (Flemish) | 84 | ▲ |
| Singapore | 83 | ▲ |
| England | 83 | ▲ |
| Scotland | 82 | ▲ |
| Lithuania | 81 | ▲ |
| Netherlands | 81 | ▲ |
| Russian Federation | 81 | ▲ |
| United States | 81 | ▲ |
| Australia | 80 | ▲ |
| Hong Kong, SAR | 79 | ▲ |
| Hungary | 78 | ▲ |
| Moldova, Republic of | 77 | ▲ |
| New Zealand | 76 | ▲ |
| Norway | 73 | O |
| **International average** | **72** | |
| Cyprus | 65 | ▼ |
| Slovenia | 65 | ▼ |
| Latvia | 61 | ▼ |
| Iran, Islamic Republic of | 57 | ▼ |
| Armenia | 49 | ▼ |
| Morocco | 47 | ▼ |
| Philippines | 43 | ▼ |
| Tunisia | 35 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | C |
|---|---|

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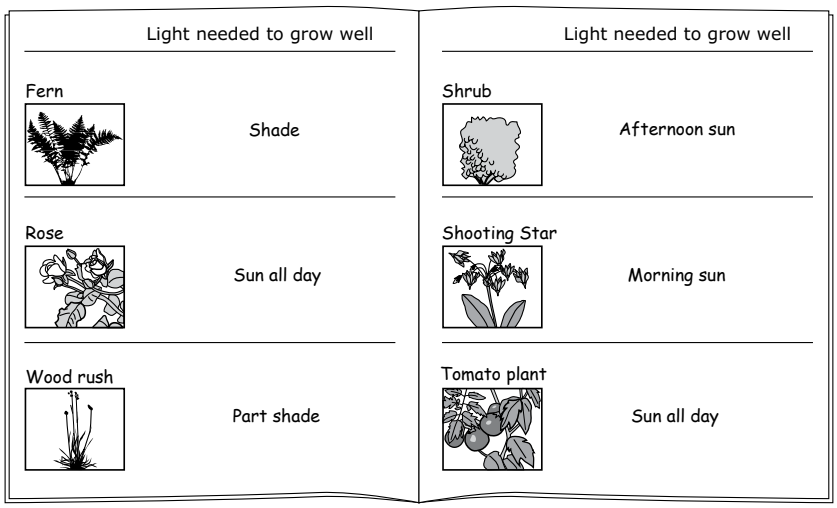
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Ecosystems | Reasoning and Analysis |

## Garden: why roses will not grow under oak trees

Rebecca wanted to plant each area with different types of plants. She collected pictures of her favorite plants and found out how much sunlight they needed to grow well. She put the pictures and the information she found into a scrap book as shown below.




A. Rebecca wanted to grow roses in Area 1 under the oak trees. Her friend Gwen disagreed and told her that the roses would **not** grow well in Area 1. Explain why Gwen says this.

*Continued*

*Item Number: S031441A*

### Overall Percent Correct

| | | |
|---|---|---|
| Netherlands | 82 | ▲ |
| Chinese Taipei | 78 | ▲ |
| Japan | 77 | ▲ |
| Singapore | 77 | ▲ |
| England | 75 | ▲ |
| Latvia | 72 | ▲ |
| Belgium (Flemish) | 72 | ▲ |
| United States | 71 | ▲ |
| Australia | 70 | ▲ |
| Hungary | 70 | ▲ |
| New Zealand | 67 | ▲ |
| Hong Kong, SAR | 63 | ▲ |
| Lithuania | 60 | O |
| Russian Federation | 60 | O |
| Scotland | 57 | O |
| **International average** | **55** | |
| Slovenia | 52 | O |
| Italy | 51 | O |
| Moldova, Republic of | 50 | O |
| Cyprus | 43 | ▼ |
| Norway | 42 | ▼ |
| Iran, Islamic Republic of | 27 | ▼ |
| Philippines | 19 | ▼ |
| Armenia | 17 | ▼ |
| Tunisia | 9 | ▼ |
| Morocco | 8 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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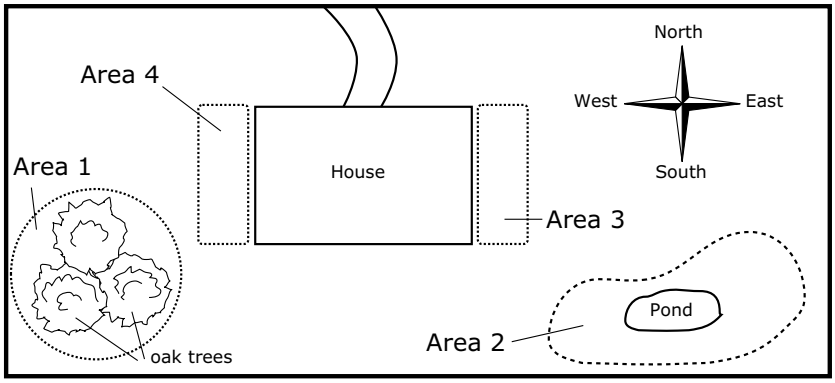
## Garden: why roses will not grow under oak trees (continued)

*Item Number: S031441A*




B. Look at the information for each plant given in Rebecca's scrap book and the plan of her garden above. Write the names of the plants that would grow best in each area in the boxes below.

| Area 1 |
|---|
| Area 2 |
| Area 3 |
| Area 4 |

*Item Number: S031441A*

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# Garden: why roses will not grow under oak trees (continued)

*Item Number: S031441A*

## SCORING

Note: Responses that refer to the amount of light or shade in Area 1 either explicitly or implicitly by referring to the need for sun given in the information in the scrap book should be scored as correct. Responses that refer to the oak trees WITHOUT any mention of light or shade are scored as incorrect.

### Correct Response

- Refers to there not being enough light (or too much shade) in Area 1 for the roses to grow (explicitly or implicitly).
  *Examples:* *Because the oak trees will block out the sun.*
  *The trees will provide too much shade.*
  *There isn't much light in Area 1.*
  *Roses need lots of sun to grow.*
  *Because it needs sun all day.*
  *They would not get much sun.*
  *Too much shade.*
- Other correct

### Incorrect Response

- Refers only to the oak trees. [No explicit reference to light/shade.]
  *Examples:* *Because of the oak trees.*
  *There is no room for roses under the oak trees.*
  *The oak trees soak up all the water.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

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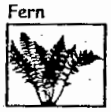
## Garden: why roses will not grow under oak trees (continued)

*Item Number: S031441A*

# Student Responses

### Correct Response:

Rebecca wanted to plant each area with different types of plants. She collected pictures of her favorite plants and found out how much sunlight they needed to grow well. She put the pictures and the information she found into a scrap book as shown below.

| Light needed to grow well | | Light needed to grow well | |
|---|---|---|---|
| Fern  | Shade | Shrub | Afternoon sun |
| Rose | Sun all day | Shooting Star | Morning sun |
| Wood rush | Part shade | Tomato plant | Sun all day |

A. Rebecca wanted to grow roses in Area 1 under the oak trees. Her friend Gwen disagreed and told her that the roses would **not** grow well in Area 1. Explain why Gwen says this. Gwen said that because in Rebecca's scrap book it says that roses have to have sun all day long, and under the shady Oak trees there's just shade no sun can really get to the roses!

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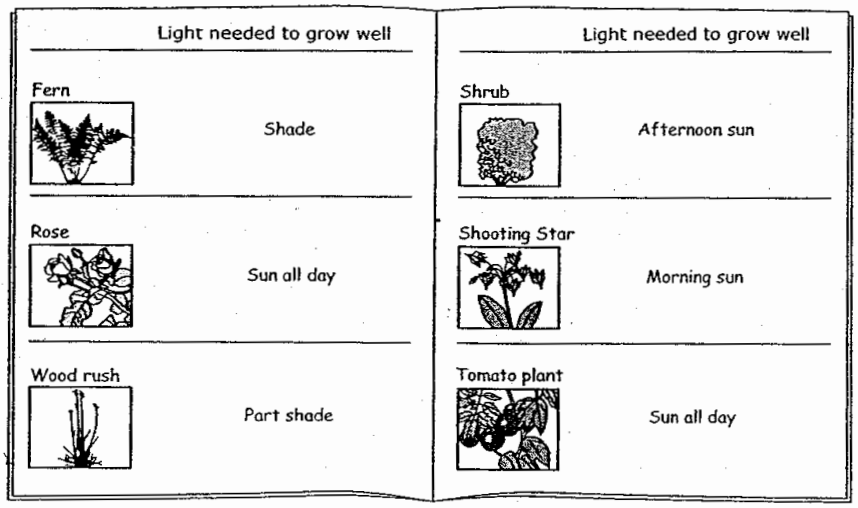
## Garden: why roses will not grow under oak trees (continued)

*Item Number: S031441A*

# Student Responses (continued)

### Incorrect Response:

Rebecca wanted to plant each area with different types of plants. She collected pictures of her favorite plants and found out how much sunlight they needed to grow well. She put the pictures and the information she found into a scrap book as shown below.




A. Rebecca wanted to grow roses in Area 1 under the oak trees. Her friend Gwen disagreed and told her that the roses would **not** grow well in Area 1. Explain why Gwen says this.

She cannot grow them under the oak trees.

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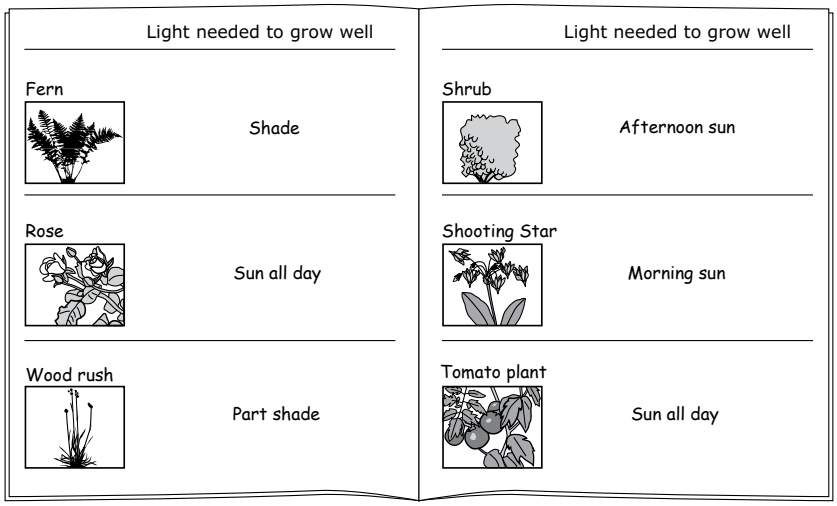
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Ecosystems | Reasoning and Analysis |

## Garden: plants that grow well in four areas

Rebecca wanted to plant each area with different types of plants. She collected pictures of her favorite plants and found out how much sunlight they needed to grow well. She put the pictures and the information she found into a scrap book as shown below.




A. Rebecca wanted to grow roses in Area 1 under the oak trees. Her friend Gwen disagreed and told her that the roses would **not** grow well in Area 1. Explain why Gwen says this.

*Continued*

*Item Number: S031441B*

### Overall Percent Correct

| | | |
|---|---|---|
| Japan | 25 | ▲ |
| Chinese Taipei | 23 | ▲ |
| United States | 23 | ▲ |
| Netherlands | 22 | ▲ |
| England | 22 | ▲ |
| Australia | 20 | ▲ |
| Hungary | 20 | ▲ |
| Russian Federation | 20 | ▲ |
| New Zealand | 19 | ▲ |
| Latvia | 18 | O |
| Singapore | 18 | ▲ |
| Belgium (Flemish) | 18 | ▲ |
| Hong Kong, SAR | 15 | O |
| Slovenia | 14 | O |
| **International average** | **13** | |
| Italy | 12 | O |
| Scotland | 11 | O |
| Lithuania | 9 | ▼ |
| Norway | 7 | ▼ |
| Moldova, Republic of | 6 | ▼ |
| Cyprus | 4 | ▼ |
| Armenia | 2 | ▼ |
| Iran, Islamic Republic of | 2 | ▼ |
| Morocco | 2 | ▼ |
| Tunisia | 2 | ▼ |
| Philippines | 1 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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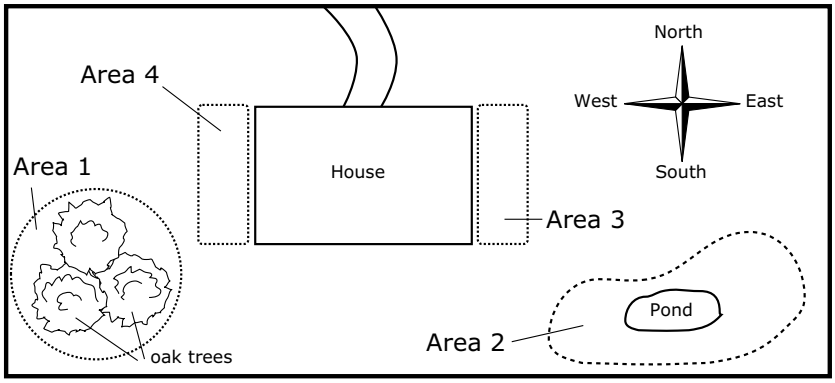
## Garden: plants that grow well in four areas (continued)

*Item Number: S031441B*




B. Look at the information for each plant given in Rebecca's scrap book and the plan of her garden above. Write the names of the plants that would grow best in each area in the boxes below.

| Area 1 |
| --- |
| Area 2 |
| Area 3 |
| Area 4 |

*Item Number: S031441B*

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# Garden: plants that grow well in four areas (continued)

*Item Number: S031441B*

## SCORING

### Correct Response

- Identifies the correct plant(s) in all four areas:

  Area 1 (shade or part shade): fern or wood rush

  Area 2 (sun all day): rose or tomato plant

  Area 3 (morning sun or part shade): shooting star or wood rush

  Area 4 (afternoon sun or part shade): shrub or wood rush

  [Consistent with correct identification of morning sun on the East (Area 3) given in previous question.]
- As above but plants in Areas 3 and 4 are reversed.

  [Consistent with an incorrect identification of morning sun on the West (Area 4) given in previous question.

### Partial Response

- Identifies correct plants in at least one area but less than four areas.

### Incorrect Response

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

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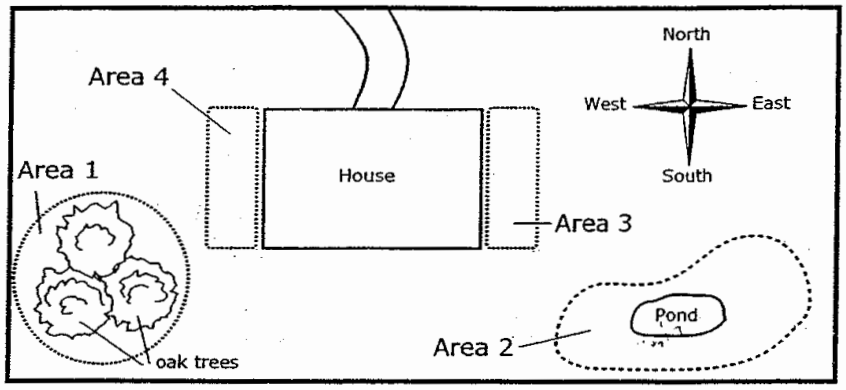
## Garden: plants that grow well in four areas (continued)

*Item Number: S031441B*

# Student Responses

### Correct Response:




B. Look at the information for each plant given in Rebecca's scrap book and the plan of her garden above. Write the names of the plants that would grow best in each area in the boxes below.

| | |
|---|---|
| Area 1 | Fern, wood rush |
| Area 2 | Roses, tomato plant |
| Area 3 | shooting star |
| Area 4 | Shrub |

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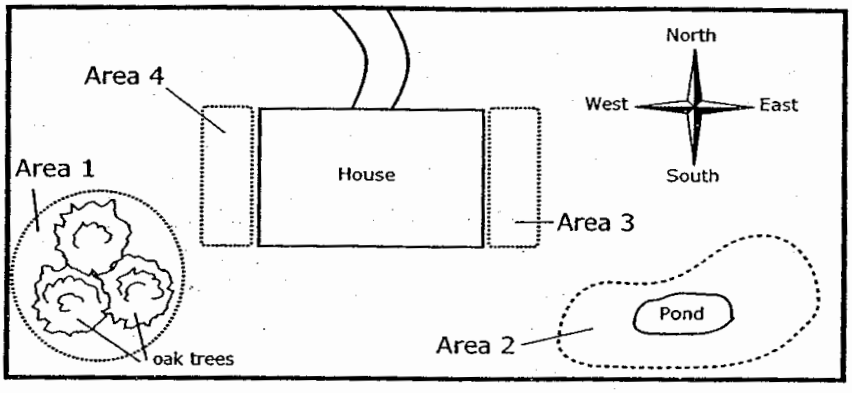
## Garden: plants that grow well in four areas (continued)

*Item Number: S031441B*

## Student Responses (continued)

### Partially Correct Response:




B. Look at the information for each plant given in Rebecca's scrap book and the plan of her garden above. Write the names of the plants that would grow best in each area in the boxes below.

| | |
|---|---|
| Area 1 | wood rush and Stub Fern |
| Area 2 | Rose |
| Area 3 | shooting Star |
| Area 4 | tomato plant |

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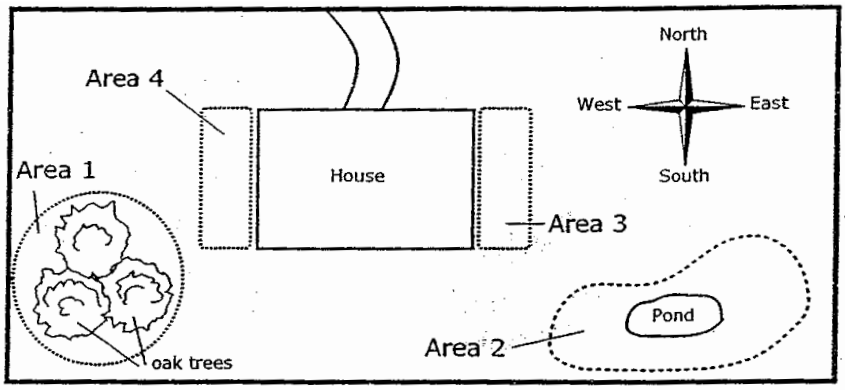
## Garden: plants that grow well in four areas (continued)

*Item Number: S031441B*

## Student Responses (continued)

### Incorrect Response:




B. Look at the information for each plant given in Rebecca's scrap book and the plan of her garden above. Write the names of the plants that would grow best in each area in the boxes below.

[West]

| | |
|---|---|
| Area 1 | shooting stars would grow good there because they get sun in the morning. So when that light hits they'll grow good. |
| Area 2 | shrub would grow good there because they get afternoon sun which gives them light. |
| Area 3 | The roses or tomato plants would grow there. |
| Area 4 | I think the roses or tomato plants could also grow there. |

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Human Health | Conceptual Understanding |

## Washing hands

How can washing your hands help keep you from getting sick?

Ⓐ It washes away germs.

Ⓑ It makes your hands look nice.

Ⓒ It keeps your skin from drying out.

Ⓓ It makes your hands warmer.

*Item Number: S011031*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 98 | ▲ |
| Japan | 98 | ▲ |
| Hong Kong, SAR | 97 | ▲ |
| United States | 97 | ▲ |
| England | 96 | ▲ |
| Scotland | 96 | ▲ |
| Latvia | 95 | ▲ |
| New Zealand | 95 | ▲ |
| Russian Federation | 95 | ▲ |
| Italy | 94 | ▲ |
| Singapore | 94 | ▲ |
| Australia | 92 | ▲ |
| Lithuania | 92 | ▲ |
| Cyprus | 91 | ▲ |
| Slovenia | 89 | O |
| Netherlands | 87 | O |
| Hungary | 86 | O |
| Norway | 86 | O |
| **International average** | **86** | |
| Iran, Islamic Republic of | 84 | O |
| Moldova, Republic of | 84 | O |
| Armenia | 69 | ▼ |
| Belgium (Flemish) | 67 | ▼ |
| Philippines | 62 | ▼ |
| Morocco | 58 | ▼ |
| Tunisia | 47 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | A |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Human Health | Conceptual Understanding |

## Protection from the sun

People need to protect themselves from getting too much sun. Name one thing that can happen to their bodies if they are not protected from the sun.

*Item Number: S031330*

## SCORING

Note: To be correct, responses must mention a specific effect. General or vague responses that refer only to illness, etc., should be scored as incorrect.

### Correct Response

- Mentions skin cancer or cancer.
  *Examples: They will get sunburn or sun cancer and might die.*
  *They might get skin cancer.*
  *Cancer.*
- Mentions sunburn, tanning, or similar.
  *Examples: They will get sunburn.*
  *Sunburn and heat rash.*
  *The sun could burn their skin and their skin would turn red.*
  *They can get a sun tan if they are not protected from the sun.*
  *Their skin can get burned from the sun.*
  *Their skin changes into a darker color when they lie in the sun for a long time.*
- Mentions a heat-related illness such as sun stroke, dehydration, heat rash, or similar.
  *Examples: People can get heat stroke from the hot sun.*
  *Heat rash.*
  *Stroke could happen.*
- Other correct
  *Examples: You could go blind if you looked directly into the sun.*
  *Sun allergy.*

### Incorrect Response

- Mentions only the sun causing illness (or similar). [No specific effect identified.]
  *Examples: Getting too much sun makes you feel sick.*
  *It can make people ill.*
  *It's bad for the whole body.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

## Overall Percent Correct

| | | |
|---|---|---|
| Netherlands | 87 | ▲ |
| England | 84 | ▲ |
| New Zealand | 83 | ▲ |
| Australia | 81 | ▲ |
| Hungary | 81 | ▲ |
| Scotland | 80 | ▲ |
| United States | 79 | ▲ |
| Lithuania | 78 | ▲ |
| Latvia | 77 | ▲ |
| Belgium (Flemish) | 76 | ▲ |
| Slovenia | 74 | ▲ |
| Italy | 72 | ▲ |
| Singapore | 72 | ▲ |
| Norway | 71 | ▲ |
| Cyprus | 69 | ▲ |
| Russian Federation | 69 | O |
| Japan | 67 | O |
| Chinese Taipei | 66 | O |
| **International average** | **65** | |
| Hong Kong, SAR | 61 | O |
| Moldova, Republic of | 57 | ▼ |
| Iran, Islamic Republic of | 47 | ▼ |
| Armenia | 41 | ▼ |
| Tunisia | 22 | ▼ |
| Philippines | 21 | ▼ |
| Morocco | 7 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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## Protection from the sun (continued)

*Item Number: S031330*

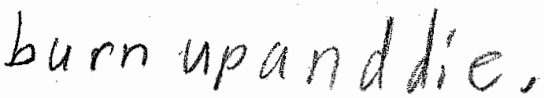
# Student Responses

### Correct Response:

People need to protect themselves from getting too much sun. Name one thing that can happen to their bodies if they are not protected from the sun.

### Incorrect Response:

People need to protect themselves from getting too much sun. Name one thing that can happen to their bodies if they are not protected from the sun.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Human Health | Factual Knowledge |

## Plant grown for food

Which plant is grown for food?

Ⓐ Rice
Ⓑ Tobacco
Ⓒ Orchid
Ⓓ Cotton

*Item Number: S011021*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 99 | ▲ |
| Hong Kong, SAR | 96 | ▲ |
| Russian Federation | 96 | ▲ |
| Lithuania | 93 | ▲ |
| Latvia | 92 | ▲ |
| Cyprus | 88 | ▲ |
| Hungary | 88 | ▲ |
| Japan | 88 | ▲ |
| Moldova, Republic of | 88 | ▲ |
| Armenia | 87 | ▲ |
| Iran, Islamic Republic of | 87 | ▲ |
| Italy | 85 | ▲ |
| Singapore | 84 | O |
| England | 84 | O |
| Scotland | 84 | O |
| Norway | 83 | O |
| Slovenia | 83 | O |
| **International average** | **82** | |
| Netherlands | 80 | O |
| Philippines | 75 | ▼ |
| United States | 75 | ▼ |
| Belgium (Flemish) | 74 | ▼ |
| Australia | 72 | ▼ |
| New Zealand | 65 | ▼ |
| Morocco | 58 | ▼ |
| Tunisia | 49 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | A |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Reproduction and Heredity | Conceptual Understanding |

## Effect on adult height

What will most likely affect your adult height?

Ⓐ The height of your parents

Ⓑ The height of your brothers and sisters

Ⓒ Your hair color

Ⓓ Your weight

*Item Number: S011033*

**Overall Percent Correct**

| | | |
|---|---|---|
| Russian Federation | 75 | ▲ |
| Netherlands | 68 | ▲ |
| Norway | 61 | ▲ |
| Lithuania | 59 | ▲ |
| Slovenia | 57 | ▲ |
| Italy | 56 | ▲ |
| Moldova, Republic of | 51 | ▲ |
| Latvia | 49 | ▲ |
| England | 49 | ▲ |
| Hungary | 48 | ▲ |
| Belgium (Flemish) | 45 | O |
| New Zealand | 44 | O |
| **International average** | **43** | |
| Iran, Islamic Republic of | 42 | O |
| Australia | 41 | O |
| Singapore | 41 | O |
| United States | 38 | ▼ |
| Scotland | 38 | ▼ |
| Armenia | 35 | ▼ |
| Philippines | 29 | ▼ |
| Cyprus | 27 | ▼ |
| Chinese Taipei | 26 | ▼ |
| Hong Kong, SAR | 25 | ▼ |
| Japan | 25 | ▼ |
| Tunisia | 22 | ▼ |
| Morocco | 20 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | A |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Reproduction and Heredity | Conceptual Understanding |

## Explain yellow color of a plant

A plant has yellow flowers. What best explains why the flowers are yellow?

Ⓐ The sunshine colored the flowers yellow.

Ⓑ The flowers of the parent plants were yellow.

Ⓒ It was very warm when they flowered.

Ⓓ It rained every day.

*Item Number: S031269*

**Overall Percent Correct**

| | | |
|---|---|---|
| Italy | 79 | ▲ |
| Lithuania | 77 | ▲ |
| Cyprus | 70 | ▲ |
| Russian Federation | 66 | ▲ |
| Singapore | 64 | ▲ |
| Latvia | 63 | ▲ |
| Hungary | 62 | ▲ |
| Japan | 62 | ▲ |
| Armenia | 60 | ▲ |
| Hong Kong, SAR | 60 | ▲ |
| Belgium (Flemish) | 59 | ▲ |
| Moldova, Republic of | 58 | O |
| Netherlands | 57 | O |
| England | 56 | O |
| Norway | 54 | O |
| **International average** | **54** | |
| Chinese Taipei | 53 | O |
| United States | 46 | ▼ |
| Australia | 43 | ▼ |
| Slovenia | 43 | ▼ |
| Scotland | 43 | ▼ |
| New Zealand | 42 | ▼ |
| Philippines | 38 | ▼ |
| Morocco | 29 | ▼ |
| Iran, Islamic Republic of | 28 | ▼ |
| Tunisia | 28 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: B**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Structure, Function, and Life Processes in Organisms | Conceptual Understanding |

## Body's use of excess food

If the body takes in more food than it uses,

Ⓐ breathing becomes faster.

Ⓑ weight is lost.

Ⓒ the heart rate increases.

Ⓓ the food is stored as fat.

*Item Number: S011004*

**Overall Percent Correct**

| | | |
|---|---|---|
| Japan | 86 | ▲ |
| Lithuania | 82 | ▲ |
| Hungary | 81 | ▲ |
| Netherlands | 80 | ▲ |
| Hong Kong, SAR | 77 | ▲ |
| Latvia | 76 | ▲ |
| Singapore | 76 | ▲ |
| United States | 76 | ▲ |
| England | 76 | ▲ |
| Belgium (Flemish) | 76 | ▲ |
| New Zealand | 75 | ▲ |
| Scotland | 75 | ▲ |
| Italy | 74 | ▲ |
| Moldova, Republic of | 74 | ▲ |
| Norway | 74 | ▲ |
| Russian Federation | 71 | O |
| Slovenia | 71 | O |
| Chinese Taipei | 70 | O |
| **International average** | **69** | |
| Australia | 68 | O |
| Armenia | 58 | ▼ |
| Cyprus | 56 | ▼ |
| Iran, Islamic Republic of | 46 | ▼ |
| Tunisia | 41 | ▼ |
| Philippines | 40 | ▼ |
| Morocco | 39 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | D |
|---|---|

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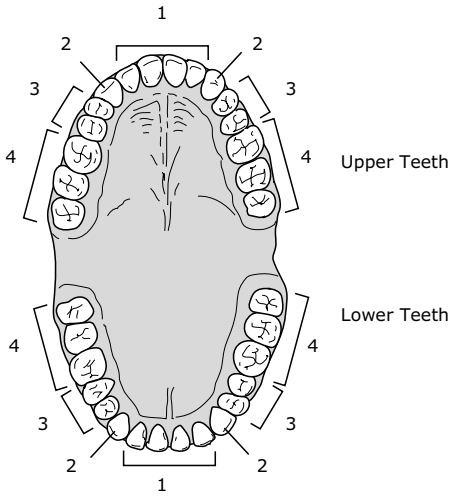
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Structure, Function, and Life Processes in Organisms | Conceptual Understanding |

## Teeth




The teeth that people use for grinding their food are labeled in the picture as

Ⓐ 1 only

Ⓑ 3 only

Ⓒ 1 and 2

Ⓓ 3 and 4

*Item Number: S011015*

**Overall Percent Correct**

| | | |
|---|---|---|
| Japan | 90 | ▲ |
| Netherlands | 88 | ▲ |
| Lithuania | 87 | ▲ |
| Singapore | 86 | ▲ |
| Russian Federation | 84 | ▲ |
| Hong Kong, SAR | 82 | ▲ |
| Hungary | 82 | ▲ |
| Latvia | 82 | ▲ |
| Chinese Taipei | 81 | ▲ |
| United States | 81 | ▲ |
| Moldova, Republic of | 80 | ▲ |
| Belgium (Flemish) | 79 | ▲ |
| **International average** | **74** | |
| England | 73 | O |
| Cyprus | 72 | O |
| Iran, Islamic Republic of | 72 | O |
| New Zealand | 71 | O |
| Armenia | 70 | ▼ |
| Italy | 70 | O |
| Scotland | 70 | O |
| Norway | 69 | ▼ |
| Australia | 68 | ▼ |
| Slovenia | 68 | ▼ |
| Philippines | 54 | ▼ |
| Tunisia | 45 | ▼ |
| Morocco | 43 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: D**

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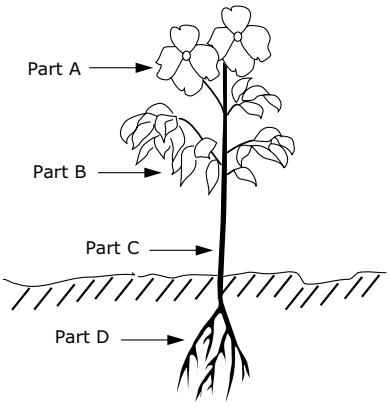
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Structure, Function, and Life Processes in Organisms | Conceptual Understanding |

## Plants and water absorption

Which part of the plant takes in the MOST water?




Ⓐ Part A
Ⓑ Part B
Ⓒ Part C
Ⓓ Part D

*Item Number: S011026*

**Correct Response: D**

### Overall Percent Correct

| | | |
|---|---|---|
| Hungary | 95 | ▲ |
| Japan | 94 | ▲ |
| Cyprus | 92 | ▲ |
| Moldova, Republic of | 92 | ▲ |
| Armenia | 91 | ▲ |
| Australia | 90 | O |
| England | 90 | ▲ |
| Latvia | 89 | O |
| New Zealand | 89 | ▲ |
| Russian Federation | 89 | O |
| Slovenia | 89 | ▲ |
| Italy | 88 | O |
| Netherlands | 88 | O |
| United States | 88 | ▲ |
| Hong Kong, SAR | 87 | O |
| Norway | 87 | O |
| Belgium (Flemish) | 87 | O |
| Chinese Taipei | 86 | O |
| Lithuania | 86 | O |
| **International average** | **86** | |
| Singapore | 85 | O |
| Scotland | 83 | ▼ |
| Philippines | 82 | O |
| Morocco | 75 | ▼ |
| Iran, Islamic Republic of | 74 | ▼ |
| Tunisia | 64 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Structure, Function, and Life Processes in Organisms | Conceptual Understanding |

## What the body does to cool down

Beth is playing soccer. She gets very hot. Name one thing her body does to cool down.

*Item Number: S031246*

## SCORING

### Correct Response

- States that the body releases sweat or equivalent.
  *Examples: Her body sweats to cool down.*
  *She sweats.*
  *Sweat.*
  *It gives off sweat.*
  *Perspire*
- Other correct
  *Examples: Blood vessels dilate.*

### Incorrect Response

- Refers only to voluntary or external activities.
  *Examples: She could jump into a lake.*
  *Beth could fan her hand in front of her face.*
  *Drink water.*
  *She needs to rest.*
  *Take a shower.*
  *She could take her jacket off.*
  *Do a cool down exercise.*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)
  *Examples: Her heart beats faster.*

**Overall Percent Correct**

| | | |
|---|---|---|
| Hong Kong, SAR | 55 | ▲ |
| Netherlands | 45 | ▲ |
| United States | 38 | ▲ |
| Russian Federation | 36 | ▲ |
| Australia | 32 | ▲ |
| England | 32 | ▲ |
| Latvia | 30 | ▲ |
| Italy | 29 | ▲ |
| New Zealand | 29 | ▲ |
| Scotland | 29 | ▲ |
| Chinese Taipei | 27 | ▲ |
| Belgium (Flemish) | 26 | O |
| Singapore | 25 | O |
| Norway | 24 | O |
| Slovenia | 24 | O |
| **International average** | **24** | |
| Armenia | 21 | O |
| Japan | 20 | ▼ |
| Moldova, Republic of | 19 | ▼ |
| Hungary | 12 | ▼ |
| Lithuania | 12 | ▼ |
| Iran, Islamic Republic of | 9 | ▼ |
| Cyprus | 8 | ▼ |
| Tunisia | 4 | ▼ |
| Morocco | 3 | ▼ |
| Philippines | 2 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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## What the body does to cool down (continued)

*Item Number: S031246*

# Student Responses

### Correct Response:

Beth is playing soccer. She gets very hot. Name one thing her body does to cool down.

Sweat

### Incorrect Response:

Beth is playing soccer. She gets very hot. Name one thing her body does to cool down.

Her body cools down by sitting down and taking a deep breath.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Structure, Function, and Life Processes in Organisms | Factual Knowledge |

## Air when a person breathes

Where does air go when a person breathes in?

Ⓐ Into the heart

Ⓑ Into the stomach

Ⓒ Into the lungs

Ⓓ Into the liver

*Item Number: S011025*

**Overall Percent Correct**

| | | |
|---|---|---|
| Lithuania | 95 | ▲ |
| Hungary | 94 | ▲ |
| Russian Federation | 93 | ▲ |
| Hong Kong, SAR | 92 | ▲ |
| Italy | 92 | ▲ |
| Latvia | 92 | ▲ |
| Slovenia | 91 | ▲ |
| England | 91 | ▲ |
| Australia | 90 | ▲ |
| Moldova, Republic of | 90 | ▲ |
| Norway | 89 | ▲ |
| United States | 89 | ▲ |
| Scotland | 89 | ▲ |
| Singapore | 88 | ▲ |
| New Zealand | 87 | ▲ |
| Netherlands | 86 | ▲ |
| Cyprus | 84 | O |
| Belgium (Flemish) | 84 | O |
| **International average** | **83** | |
| Iran, Islamic Republic of | 81 | O |
| Armenia | 76 | ▼ |
| Tunisia | 68 | ▼ |
| Chinese Taipei | 67 | ▼ |
| Morocco | 67 | ▼ |
| Japan | 58 | ▼ |
| Philippines | 39 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: C**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Structure, Function, and Life Processes in Organisms | Factual Knowledge |

## Interpretation of senses

Humans interpret seeing, hearing, tasting and smelling in the

Ⓐ brain
Ⓑ spinal cord
Ⓒ receptors
Ⓓ skin

*Item Number: S012033*

**Overall Percent Correct**

| | | |
|---|---|---|
| Russian Federation | 84 | ▲ |
| Moldova, Republic of | 82 | ▲ |
| Norway | 79 | ▲ |
| Hong Kong, SAR | 77 | ▲ |
| Hungary | 75 | ▲ |
| England | 69 | ▲ |
| Belgium (Flemish) | 69 | ▲ |
| New Zealand | 68 | ▲ |
| Australia | 67 | ▲ |
| United States | 66 | ▲ |
| Scotland | 65 | ▲ |
| Singapore | 64 | ▲ |
| Japan | 62 | O |
| Latvia | 61 | O |
| **International average** | **59** | |
| Netherlands | 52 | ▼ |
| Morocco | 48 | ▼ |
| Chinese Taipei | 46 | ▼ |
| Italy | 43 | ▼ |
| Slovenia | 40 | ▼ |
| Philippines | 39 | ▼ |
| Lithuania | 38 | ▼ |
| Iran, Islamic Republic of | 37 | ▼ |
| Tunisia | 23 | ▼ |
| Armenia | 0 | ▼ |
| Cyprus | 0 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

**Correct Response: A**

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Structure, Function, and Life Processes in Organisms | Reasoning and Analysis |

## Pulse/breathing rate after exercise

Immediately before and after running a 50 meter race, your pulse and breathing rates are taken. What changes would you expect to find?

Ⓐ no change in pulse but a decrease in breathing rate

Ⓑ an increase in pulse but no change in breathing rate

Ⓒ an increase in pulse and breathing rate

Ⓓ a decrease in pulse and breathing rate

Ⓔ no change in either

*Item Number: S012010*

**Overall Percent Correct**

| | | |
|---|---|---|
| Chinese Taipei | 92 | ▲ |
| Netherlands | 86 | ▲ |
| Hong Kong, SAR | 85 | ▲ |
| Singapore | 85 | ▲ |
| Lithuania | 78 | ▲ |
| Norway | 77 | ▲ |
| Slovenia | 77 | ▲ |
| Hungary | 74 | ▲ |
| England | 73 | ▲ |
| Japan | 72 | ▲ |
| Russian Federation | 72 | ▲ |
| Latvia | 70 | O |
| Australia | 67 | O |
| **International average** | **67** | |
| United States | 65 | O |
| Italy | 63 | O |
| New Zealand | 63 | ▼ |
| Scotland | 63 | O |
| Armenia | 60 | ▼ |
| Moldova, Republic of | 59 | ▼ |
| Belgium (Flemish) | 58 | ▼ |
| Cyprus | 52 | ▼ |
| Iran, Islamic Republic of | 52 | ▼ |
| Tunisia | 48 | ▼ |
| Morocco | 47 | ▼ |
| Philippines | 29 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | C |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Structure, Function, and Life Processes in Organisms | Reasoning and Analysis |

## Garden: how seeds get into garden

Rebecca planted her garden. After a few months, she noticed some plants growing that she had not planted. She knew that the plants must have grown from seeds. She collected some seeds from one of the plants. The plant and seeds are shown in the picture below.

Plant

Seeds

How did the seeds most likely get into her garden?

*Item Number: S031442*

**Overall Percent Correct**

| | | |
|---|---|---|
| Japan | 81 | ▲ |
| Chinese Taipei | 69 | ▲ |
| Netherlands | 68 | ▲ |
| Belgium (Flemish) | 61 | ▲ |
| England | 59 | ▲ |
| Lithuania | 58 | ▲ |
| Russian Federation | 57 | ▲ |
| Hungary | 56 | ▲ |
| Latvia | 56 | ▲ |
| Hong Kong, SAR | 53 | ▲ |
| United States | 47 | ▲ |
| Slovenia | 43 | O |
| Italy | 42 | O |
| **International average** | **42** | |
| Moldova, Republic of | 40 | O |
| Australia | 39 | O |
| Singapore | 39 | O |
| New Zealand | 34 | ▼ |
| Norway | 33 | ▼ |
| Scotland | 33 | ▼ |
| Cyprus | 27 | ▼ |
| Armenia | 18 | ▼ |
| Iran, Islamic Republic of | 11 | ▼ |
| Philippines | 10 | ▼ |
| Tunisia | 5 | ▼ |
| Morocco | 3 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

## SCORING

### Correct Response

- States that the seeds were blown into the garden (by the wind) or similar.
  *Examples: The wind blew them.*
  *They flew into the garden.*
  *They were carried through the air.*
  *Someone blew the plant for wishes and the seeds flew off.*
- Other correct
  *Examples: Birds could have dropped them.*

### Incorrect Response

- States only that someone planted the seeds there (or similar).
  *Examples: Rebecca must have planted them and forgot about it.*
  *Somebody else put them there.*
- States only that the seeds came from a plant. [No method of dispersal included.]
  *Examples: The seeds fell from the plant.*
  *Some other plants might have grown the seeds.*
  *She got them from another plant.*
- Other incorrect (including crossed out/erased, stray marks, illegible or off task)

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## Garden: how seeds get into garden (continued)

*Item Number: S031442*

# Student Responses

### Correct Response:

Rebecca planted her garden. After a few months, she noticed some plants growing that she had not planted. She knew that the plants must have grown from seeds. She collected some seeds from one of the plants. The plant and seeds are shown in the picture below.

Plant

Seeds

How did the seeds most likely get into her garden?

They blew off the plant.

### Incorrect Response:

Rebecca planted her garden. After a few months, she noticed some plants growing that she had not planted. She knew that the plants must have grown from seeds. She collected some seeds from one of the plants. The plant and seeds are shown in the picture below.

Plant

Seeds

How did the seeds most likely get into her garden?

The seeds fell from certen trees.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Types, Characteristics, and Classification of Living Things | Conceptual Understanding |

## Which doesn't lay eggs

Which one of these animals does NOT lay eggs?

Ⓐ chickens
Ⓑ dogs
Ⓒ frogs
Ⓓ turtles

*Item Number: S011016*

**Overall Percent Correct**

| | | |
|---|---|---|
| Singapore | 97 | ▲ |
| United States | 97 | ▲ |
| Belgium (Flemish) | 97 | ▲ |
| Australia | 96 | ▲ |
| Russian Federation | 96 | ▲ |
| Scotland | 96 | ▲ |
| Italy | 95 | ▲ |
| Lithuania | 95 | ▲ |
| England | 95 | ▲ |
| Chinese Taipei | 94 | ▲ |
| Latvia | 94 | ▲ |
| Norway | 94 | ▲ |
| Japan | 93 | ▲ |
| New Zealand | 92 | ▲ |
| Moldova, Republic of | 91 | O |
| Netherlands | 91 | O |
| Slovenia | 91 | O |
| Hungary | 90 | O |
| Hong Kong, SAR | 89 | O |
| **International average** | **89** | |
| Cyprus | 88 | O |
| Armenia | 82 | ▼ |
| Iran, Islamic Republic of | 79 | ▼ |
| Philippines | 75 | ▼ |
| Morocco | 69 | ▼ |
| Tunisia | 52 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

| Correct Response: | B |
|---|---|

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Types, Characteristics, and Classification of Living Things | Conceptual Understanding |

## Are plants living or nonliving

Are plants living or nonliving?

(Check one box.)

☐ Living

☐ Nonliving

Explain your answer.

*Item Number: S031218*

## SCORING

### Correct Response

- **LIVING** with a correct explanation that refers to reproduction, response to stimuli or cellular structure (or similar).
  *Examples: They reproduce.*
  *They respond to light (a stimulus).*
  *They are made up of cells.*
  *Plants can move, grow and reproduce.*
  *They reproduce and respond to changes.*
- **LIVING** with a correct explanation that refers to basic needs, life/death cycle, growth, movement, functions, etc.
  *Examples: They make their own food.*
  *They breathe.*
  *They grow.*
  *They require air (oxygen).*
  *They need light to grow.*
  *They need air, water and food or they will die.*
  *They can die.*
  *They eat and drink.*

  Note: Some human terms for function are accepted as applied to plants even if they are not strictly correct. For example, 'breathe' is accepted as meaning that plants take in air (oxygen, carbon dioxide) and 'drink' is accepted as meaning that plants take in water.
- Other correct

### Incorrect Response

- **LIVING** with no explanation or an incorrect explanation.
  *Examples: They are green.*
  *Because of sun and rain.*
- **NON-LIVING** with or without explanation.

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

## Overall Percent Correct

| | | |
|---|---|---|
| Singapore | 84 | ▲ |
| Japan | 77 | ▲ |
| Latvia | 72 | ▲ |
| Italy | 71 | ▲ |
| Netherlands | 70 | ▲ |
| Hungary | 66 | ▲ |
| Chinese Taipei | 65 | ▲ |
| Belgium (Flemish) | 64 | ▲ |
| Slovenia | 63 | ▲ |
| England | 63 | ▲ |
| New Zealand | 61 | ▲ |
| Australia | 60 | ▲ |
| United States | 60 | ▲ |
| Hong Kong, SAR | 57 | O |
| Lithuania | 55 | O |
| **International average** | **53** | |
| Scotland | 50 | O |
| Cyprus | 48 | ▼ |
| Moldova, Republic of | 43 | ▼ |
| Norway | 41 | ▼ |
| Iran, Islamic Republic of | 40 | ▼ |
| Russian Federation | 40 | ▼ |
| Armenia | 32 | ▼ |
| Tunisia | 20 | ▼ |
| Philippines | 19 | ▼ |
| Morocco | 14 | ▼ |

**Country average vs. International average:**

| | |
|---|---|
| Higher | ▲ |
| Not different | O |
| Lower | ▼ |

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## Are plants living or nonliving (continued)

*Item Number: S031218*

# Student Responses

### Correct Response:

Are plants living or nonliving?

(Check one box.)

☑ Living

☐ Nonliving

Explain your answer.

Plants are living because they grow just like we do.

### Incorrect Response:

Are plants living or nonliving?

(Check one box.)

☑ Living

☐ Nonliving

Explain your answer.

If they are nonliving they could not stand up.

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| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| LIFE SCIENCE | Types, Characteristics, and Classification of Living Things | Factual Knowledge |

## Group that consists only of living things

Which group consists only of living things?

Ⓐ rabbit, seed, bird

Ⓑ seed, bird, wind

Ⓒ volcano, candle, rabbit

Ⓓ wind, candle, volcano

*Item Number: S031212*

**Overall Percent Correct**

| | | |
|---|---|---|
| Italy | 89 | ▲ |
| Singapore | 89 | ▲ |
| Hong Kong, SAR | 87 | ▲ |
| Japan | 87 | ▲ |
| Russian Federation | 86 | ▲ |
| Hungary | 84 | ▲ |
| Latvia | 78 | ▲ |
| Moldova, Republic of | 76 | ▲ |
| Chinese Taipei | 72 | ▲ |
| Netherlands | 72 | O |
| United States | 72 | ▲ |
| England | 72 | O |
| Cyprus | 69 | O |
| Scotland | 69 | O |
| **International average** | **69** | |
| Australia | 65 | O |
| Lithuania | 65 | ▼ |
| New Zealand | 64 | ▼ |
| Belgium (Flemish) | 64 | ▼ |
| Iran, Islamic Republic of | 61 | ▼ |
| Armenia | 58 | ▼ |
| Slovenia | 58 | ▼ |
| Norway | 50 | ▼ |
| Philippines | 49 | ▼ |
| Morocco | 41 | ▼ |
| Tunisia | 40 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | A |
|---|---|

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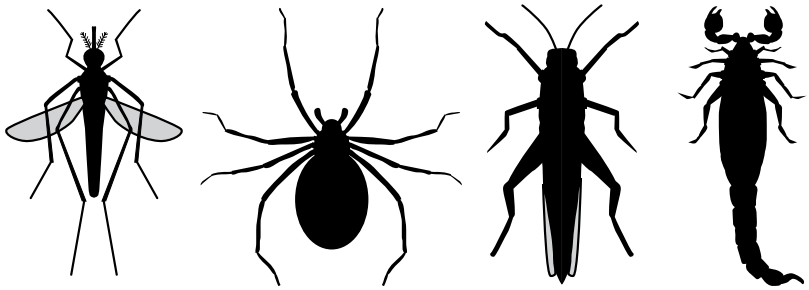
| Content Domain | Main Topic | Cognitive Domain |
|---|---|---|
| **LIFE SCIENCE** | Types, Characteristics, and Classification of Living Things | Factual Knowledge |

## Which are insects

Which of these are insects?



1 2 3 4

Ⓐ 1 and 3 only

Ⓑ 1 and 4 only

Ⓒ 2 and 4 only

Ⓓ 3 and 4 only

*Item Number: S031349*

**Overall Percent Correct**

| | | |
|---|---|---|
| Lithuania | 94 | ▲ |
| Singapore | 92 | ▲ |
| Italy | 91 | ▲ |
| Japan | 91 | ▲ |
| Russian Federation | 91 | ▲ |
| United States | 91 | ▲ |
| Norway | 90 | ▲ |
| Chinese Taipei | 89 | ▲ |
| Netherlands | 89 | ▲ |
| Belgium (Flemish) | 89 | ▲ |
| Australia | 88 | ▲ |
| Hungary | 86 | ▲ |
| England | 86 | ▲ |
| Cyprus | 85 | ▲ |
| Moldova, Republic of | 85 | ▲ |
| New Zealand | 85 | ▲ |
| Latvia | 84 | ▲ |
| Scotland | 83 | O |
| Hong Kong, SAR | 81 | O |
| **International average** | **81** | |
| Slovenia | 79 | O |
| Iran, Islamic Republic of | 76 | ▼ |
| Philippines | 64 | ▼ |
| Armenia | 59 | ▼ |
| Tunisia | 49 | ▼ |
| Morocco | 35 | ▼ |

**Country average vs. International average:**

Higher ▲
Not different O
Lower ▼

| Correct Response: | A |
|---|---|

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