

# SCIENCE CONCEPTS & SCIENCE ITEMS

The *Science Concepts and Science Items* book contains the released TIMSS science assessment items. These are the released items from the 1995 and 2003 assessments (as distinct from the secure items, which are kept confidential so that they may be used in subsequent cycles to monitor trends).

## Guide to Using the *Science Concepts and Science Items* Materials

The materials contained in this book can be used in a number of ways as a tool to assist teachers in making a formative assessment of student knowledge and skills. Some of these ways include the following:

**Teacher-designed formative assessments.** A teacher might, for example, decide to examine how well his or her class can use tools, routine procedures, and science processes. In such a case, the first step would be to review the questions in *Science Concepts and Science Items*, selecting the ones of interest. Ready-to-use versions of these items can be found in the *Science Items* book. The teacher can print these items or present them to students on an overhead. Student responses can be scored by referring to the appropriate page in *Science Concepts and Science Items*. The teacher can also compare the overall percentage of students responding correctly to the international benchmark for that item.

**Feedback on teaching.** To the extent that the items coincide with concepts taught, the teacher might follow the same process to gain rapid feedback on the success of the teaching episode.

**Understanding misunderstandings.** Again, a teacher might decide to examine the incorrect or partially correct responses of the class for insight into any general misunderstandings, with a view to re-teaching a particular topic or skill.

**Identifying individual difficulties.** In the same way, the teacher might use the items to identify particular difficulties experienced by individual students, as the basis for some remedial teaching or focused practice.

## Guide to the Content and Layout of This Book

This book contains the released items from both TIMSS 1995 and 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.

### 1995 Content Domains:

- Earth science
- Life science
- Physical science
- Environmental issues and the nature of science

### 2003 Content Domains:

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

### 1995 Cognitive Domains:

- Understanding simple information
- Understanding complex information
- Theorizing, analyzing and solving problems
- Using tools, routine procedures and science processes
- Investigating the natural world

### 2003 Cognitive Domains:

- Factual knowledge
- Conceptual understanding
- Reasoning and analysis

Take a look at *Temperature/precipitation table*, the name given to the first item in this book. As specified in boxes at the top of the page, the content domain for this item is *earth science* and the cognitive domain is *using tools, routine procedures and science processes*. Looking at *Which decays fastest*, the first item from TIMSS 2003 (page 68), 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. *Temperature/precipitation table* provides an example of the letter code type—the correct answer is B.
- **Scoring guide.** This form is used to assist in scoring write-in responses. *Snow on mountain (O9)* further along in the *earth science* domain (page 5), provides an example of the scoring guide approach, indicating the general nature of correct and incorrect 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 TIMSS 2003 extended response items. An example of an actual U.S. fourth-grade student's response is provided for each scoring category. See Item S031406A on page 74.

**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 | Cognitive Domain                                       |
|----------------|--|
| Earth Science  | Using Tools, Routine Procedures, and Science Processes |

## Temperature/precipitation table

This table shows the temperature and precipitation (rain or snow) in four different towns on the same day.

|                              | Town A | Town B | Town C | Town D |
|------------------------------|--------|--------|--------|--------|
| Lowest Temperature           | 13°C   | -9°C   | 22°C   | -12°C  |
| Highest Temperature          | 25°C   | -1°C   | 30°C   | -4°C   |
| Precipitation (rain or snow) | 0 cm   | 5 cm   | 2.5 cm | 0 cm   |

Where did it snow?

- A. Town A
- B. Town B
- C. Town C
- D. Town D

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 69        | ▲ |
| Hong Kong                    | 63        | ▲ |
| Czech Republic               | 60        | ▲ |
| Netherlands                  | 60        | ▲ |
| Korea                        | 56        | ▲ |
| Slovenia                     | 55        | ▲ |
| United States                | 54        | ▲ |
| Austria                      | 52        | ○ |
| Hungary                      | 49        | ○ |
| Latvia (LSS)                 | 48        | ○ |
| Canada                       | 47        | ○ |
| Australia                    | 46        | ○ |
| Israel                       | 44        | ○ |
| Norway                       | 44        | ○ |
| <b>International average</b> | <b>44</b> |   |
| Singapore                    | 41        | ○ |
| New Zealand                  | 39        | ○ |
| Ireland                      | 38        | ○ |
| Iceland                      | 36        | ○ |
| Cyprus                       | 32        | ▼ |
| England                      | 32        | ▼ |
| Iran, Islamic Rep.           | 31        | ▼ |
| Scotland                     | 31        | ▼ |
| Greece                       | 30        | ▼ |
| Kuwait                       | 27        | ▼ |
| Thailand                     | 27        | ▼ |
| Portugal                     | 26        | ▼ |

## Country average vs. International average:

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

Item Number: N1

Correct Response:

**B**

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Earth Science  | Understanding Simple Information |

## Moon shining at night

The Moon produces no light, and yet it shines at night. Why is this?

- A. The Moon reflects the light from the Sun.
- B. The Moon rotates at a very high speed.
- C. The Moon is covered with a thin layer of ice.
- D. The Moon has many craters.

## Overall Percent Correct

|                                 |    |   |
|---------------------------------|----|---|
| Hong Kong                       | 87 | ▲ |
| Singapore                       | 86 | ▲ |
| Norway                          | 85 | ▲ |
| Netherlands                     | 81 | ▲ |
| Austria                         | 79 | ▲ |
| Hungary                         | 78 | ▲ |
| Portugal                        | 77 | ○ |
| Czech Republic                  | 76 | ○ |
| Korea                           | 76 | ○ |
| United States                   | 75 | ○ |
| England                         | 72 | ○ |
| Slovenia                        | 72 | ○ |
| Australia                       | 70 | ○ |
| <b>International average 70</b> |    |   |
| Ireland                         | 69 | ○ |
| Canada                          | 68 | ○ |
| Greece                          | 67 | ○ |
| Iceland                         | 64 | ○ |
| New Zealand                     | 64 | ○ |
| Thailand                        | 64 | ○ |
| Scotland                        | 63 | ○ |
| Latvia (LSS)                    | 62 | ○ |
| Japan                           | 58 | ▼ |
| Kuwait                          | 58 | ▼ |
| Iran, Islamic Rep.              | 56 | ▼ |
| Cyprus                          | 54 | ▼ |
| Israel                          | 52 | ▼ |

Country average vs.  
International average:

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

Item Number: O4

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

| Content Domain | Cognitive Domain                            |
|----------------|---|
| Earth Science  | Theorizing, Analyzing, and Solving Problems |

### Snow on mountain

Sometimes mountains can still have snow on their tops when the snow on the lower parts of the mountains has melted. What makes this happen?

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 73        | ▲ |
| Korea                        | 70        | ▲ |
| Hungary                      | 67        | ▲ |
| Norway                       | 64        | ▲ |
| Czech Republic               | 60        | ▲ |
| Canada                       | 54        | ○ |
| England                      | 54        | ▲ |
| United States                | 53        | ○ |
| Netherlands                  | 52        | ○ |
| Iceland                      | 50        | ○ |
| Scotland                     | 48        | ○ |
| Latvia (LSS)                 | 47        | ○ |
| Slovenia                     | 47        | ○ |
| Hong Kong                    | 46        | ○ |
| Israel                       | 46        | ○ |
| <b>International average</b> | <b>46</b> |   |
| Iran, Islamic Rep.           | 42        | ○ |
| Ireland                      | 41        | ○ |
| New Zealand                  | 41        | ○ |
| Australia                    | 37        | ▼ |
| Portugal                     | 33        | ▼ |
| Singapore                    | 33        | ▼ |
| Austria                      | 30        | ▼ |
| Cyprus                       | 29        | ▼ |
| Greece                       | 28        | ▼ |
| Thailand                     | 24        | ▼ |
| Kuwait                       | 22        | ▼ |

#### Country average vs. International average:

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

Item Number: O9

## SCORING

### Correct Response

- Mentions that it is colder on the mountain tops or warmer farther down.  
Example: The air is colder higher up.
- Mentions that more snow is falling high up in the mountains.
- Other correct.

### Incorrect Response

- Mentions that there is sunshine lower down or there is more sunshine lower down.
- Refers to sun or heat melting the snow.  
Examples: *The sun is warm.*  
*Sun shines and the snow melts.*
- Refers to the mountain being very high.
- Refers to the wind blowing more on the mountain top.
- Merely repeats information in stem.
- Other incorrect.

| Content Domain | Cognitive Domain                            |
|----------------|---|
| Earth Science  | Theorizing, Analyzing, and Solving Problems |

### Size of sun and moon

The Sun is bigger than the Moon, but they appear to be about the same size when you look at them from the Earth. Why is this?

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 46        | ▲ |
| Australia                    | 44        | ▲ |
| Japan                        | 43        | ▲ |
| Norway                       | 43        | ▲ |
| Austria                      | 40        | ▲ |
| Czech Republic               | 38        | ▲ |
| Iceland                      | 38        | ○ |
| Netherlands                  | 38        | ▲ |
| Canada                       | 36        | ▲ |
| Scotland                     | 36        | ○ |
| England                      | 35        | ○ |
| New Zealand                  | 34        | ○ |
| Hungary                      | 33        | ○ |
| Ireland                      | 33        | ○ |
| United States                | 33        | ○ |
| <b>International average</b> | <b>31</b> |   |
| Hong Kong                    | 30        | ○ |
| Latvia (LSS)                 | 30        | ○ |
| Slovenia                     | 29        | ○ |
| Singapore                    | 27        | ○ |
| Israel                       | 25        | ○ |
| Thailand                     | 18        | ▼ |
| Kuwait                       | 16        | ▼ |
| Portugal                     | 15        | ▼ |
| Greece                       | 12        | ▼ |
| Iran, Islamic Rep.           | 12        | ▼ |
| Cyprus                       | 9         | ▼ |

Item Number: Y1

### SCORING

#### Correct Response

- Mentions that the sun is farther away than the moon. Comparative language is used.  
*Example: The moon is closer to the Earth.*
- Other correct responses comparing apparent sizes.

#### Incorrect Response

- Includes some reference to the light.  
*Examples: The sun shines on the moon.*  
*The moon shines only in the night.*
- States that the sun is closer than the moon.
- Refers to distance, but response is general, not specified.  
*Examples: We are so far away from the sun.*  
*The distance is so long.*
- Refers to the sun being higher up than the moon.
- Other acceptable but incomplete or slightly erroneous responses.
- Repeats the information in the stem.  
*Example: The sun is bigger than the moon.*
- Other incorrect:  
*Examples: Because you are in the same place.*  
*Because the sun is rotating.*

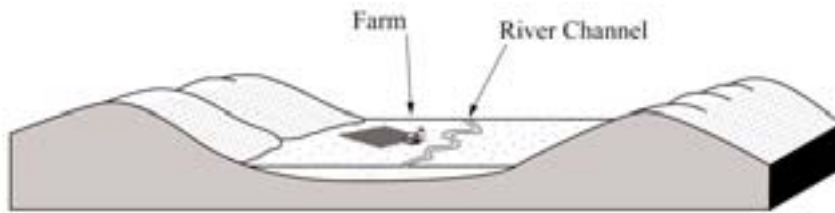
#### Country average vs. International average:

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

| Content Domain | Cognitive Domain                            |
|----------------|---|
| Earth Science  | Theorizing, Analyzing, and Solving Problems |

### River on the plain: good place for farming

The diagram shows a river flowing through a wide plain. The plain is covered with several layers of soil and sediment.



- Write down one reason why this plain is a good place for farming.
- Write down one reason why this plain is NOT a good place for farming.

### Overall Percent Correct

|               |    |   |
|---------------|----|---|
| Korea         | 91 | ▲ |
| United States | 83 | ▲ |
| Singapore     | 78 | ▲ |
| Australia     | 76 | ▲ |
| Japan         | 75 | ▲ |
| England       | 74 | ▲ |
| Scotland      | 72 | ▲ |
| Ireland       | 70 | ▲ |
| Hungary       | 69 | ▲ |
| New Zealand   | 69 | ○ |
| Thailand      | 69 | ○ |
| Canada        | 68 | ○ |
| Hong Kong     | 65 | ○ |

#### International average 62

|                    |    |   |
|--------------------|----|---|
| Greece             | 62 | ○ |
| Netherlands        | 62 | ○ |
| Israel             | 59 | ○ |
| Slovenia           | 59 | ○ |
| Cyprus             | 56 | ○ |
| Norway             | 56 | ○ |
| Czech Republic     | 54 | ▼ |
| Latvia (LSS)       | 52 | ▼ |
| Austria            | 51 | ▼ |
| Portugal           | 49 | ▼ |
| Iran, Islamic Rep. | 40 | ▼ |
| Iceland            | 38 | ▼ |
| Kuwait             | 23 | ▼ |

#### Country average vs. International average:

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

Item Number: Z1A

## SCORING

### Part a: Scoring for reason plain is a good place for farming.

#### Correct Response

- Mentions that the soil is fertile (good), abundant.
- Mentions that there is a river (for irrigation, water for animals).
- Mentions that there is plenty of space or flat areas for farm land.
- Other correct:  
*Example: The goats can find grass in the mountains.*

#### Incorrect Response

- Does not address the issue of farming.  
*Examples: It is silent, a peaceful place to live.  
You can swim in the river.*
- Merely repeats information in stem.
- Other incorrect.

|                       |   |
|-----------------------|---|
| <b>Content Domain</b> | <b>Cognitive Domain</b>                     |
| <b>Earth Science</b>  | Theorizing, Analyzing, and Solving Problems |

River on the plain: bad place for farming

The diagram shows a river flowing through a wide plain. The plain is covered with several layers of soil and sediment.

a. Write down one reason why this plain is a good place for farming.

b. Write down one reason why this plain is NOT a good place for farming.

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Netherlands                  | 45        | ▲ |
| England                      | 40        | ▲ |
| Ireland                      | 36        | ▲ |
| Slovenia                     | 36        | ▲ |
| Hungary                      | 35        | ▲ |
| Korea                        | 32        | ▲ |
| New Zealand                  | 32        | ▲ |
| United States                | 28        | ▲ |
| Scotland                     | 27        | ○ |
| Israel                       | 26        | ○ |
| Canada                       | 25        | ○ |
| Thailand                     | 25        | ○ |
| Australia                    | 23        | ○ |
| <b>International average</b> | <b>23</b> |   |
| Czech Republic               | 22        | ○ |
| Austria                      | 20        | ○ |
| Latvia (LSS)                 | 20        | ○ |
| Singapore                    | 19        | ○ |
| Norway                       | 16        | ▼ |
| Greece                       | 13        | ▼ |
| Iceland                      | 12        | ▼ |
| Japan                        | 12        | ▼ |
| Portugal                     | 11        | ▼ |
| Iran, Islamic Rep.           | 10        | ▼ |
| Cyprus                       | 9         | ▼ |
| Hong Kong                    | 9         | ▼ |
| Kuwait                       | 7         | ▼ |

Item Number: Z1B

**SCORING**

**Part b: Scoring for reason plain is not a good place for farming.**

**Correct Response**

- Mentions the possibility of flooding, or that the soil will be too wet.
- Mentions the possibility of wind or water erosion.
- Other correct:  
*Examples: They might not get a lot of sunlight.  
 The farmer would have to climb the hills to sell or trade his meat, vegetables, or fruit.  
 It might be in the rain shadow of one of the mountains or hills.*

**Incorrect Response**

- Mentions that it is an undesirable place to live: boring/lonesome/ugly...  
*Example: Too far from the city.*
- Does not address the issue of farming.  
*Example: The river is dangerous [for children].*
- Refers to problems due to surrounding mountains.  
*Examples: Avalanches (snow or rocks) from the mountains.  
 Goats get lost in the mountains.*
- Refers to sediment, soil, being rocky and negative.
- Merely repeats information in stem.
- Other incorrect.

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |



| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

Which are living things

Which one of these refers only to living things?

A. clouds, fire, rivers

B. fire, rivers, trees

C. rivers, birds, trees

D. birds, trees, worms

E. trees, worms, clouds

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 94        | ▲ |
| Korea                        | 91        | ▲ |
| Netherlands                  | 88        | ▲ |
| Austria                      | 86        | ▲ |
| Ireland                      | 85        | ▲ |
| Czech Republic               | 84        | ▲ |
| Slovenia                     | 84        | ▲ |
| England                      | 79        | ○ |
| Scotland                     | 79        | ○ |
| Israel                       | 78        | ○ |
| Singapore                    | 78        | ○ |
| Hong Kong                    | 77        | ○ |
| Thailand                     | 77        | ○ |
| Australia                    | 76        | ○ |
| <b>International average</b> | <b>74</b> |   |
| United States                | 74        | ○ |
| Canada                       | 73        | ○ |
| Hungary                      | 71        | ○ |
| Portugal                     | 70        | ○ |
| Iceland                      | 68        | ○ |
| New Zealand                  | 66        | ○ |
| Greece                       | 65        | ▼ |
| Latvia (LSS)                 | 65        | ○ |
| Norway                       | 61        | ▼ |
| Cyprus                       | 60        | ▼ |
| Kuwait                       | 60        | ▼ |
| Iran, Islamic Rep.           | 47        | ▼ |

### Country average vs. International average:

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

Item Number: N2

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

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

## Body temperature

Your temperature is taken when you are NOT sick. Which temperature is CLOSEST to what the thermometer would show?

- A. 29°C
- B. 37°C
- C. 100°C
- D. 212°C

## Overall Percent Correct

|                |    |   |
|----------------|----|---|
| Japan          | 74 | ▲ |
| Singapore      | 71 | ▲ |
| Netherlands    | 70 | ▲ |
| United States  | 62 | ▲ |
| Czech Republic | 60 | ▲ |
| Slovenia       | 59 | ▲ |
| Austria        | 58 | ▲ |
| Hong Kong      | 58 | ▲ |
| Korea          | 58 | ▲ |
| Iceland        | 57 | ▲ |
| Kuwait         | 57 | ▲ |
| Norway         | 54 | ○ |
| Latvia (LSS)   | 50 | ○ |

**International average 48**

|                    |    |   |
|--------------------|----|---|
| Israel             | 44 | ○ |
| Australia          | 43 | ○ |
| Greece             | 42 | ○ |
| Hungary            | 42 | ○ |
| Portugal           | 40 | ○ |
| Canada             | 37 | ▼ |
| Cyprus             | 33 | ▼ |
| New Zealand        | 32 | ▼ |
| Scotland           | 32 | ▼ |
| England            | 31 | ▼ |
| Thailand           | 28 | ▼ |
| Ireland            | 27 | ▼ |
| Iran, Islamic Rep. | 17 | ▼ |

**Country average vs.  
International average:**

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


Item Number: N3

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

|                       |   |
|-----------------------|---|
| <b>Content Domain</b> | <b>Cognitive Domain</b>                 |
| <b>Life Science</b>   | <b>Understanding Simple Information</b> |

Where does bird live

This is a drawing of a bird's foot.



Where would you be MOST likely to find such a bird?

- A. a forest
- B. a meadow
- C. a cornfield
- D. a desert
- E. a lake

| Overall Percent Correct      |           |   |
|------------------------------|-----------|---|
| Korea                        | 88        | ▲ |
| Czech Republic               | 83        | ▲ |
| Netherlands                  | 83        | ▲ |
| Greece                       | 82        | ▲ |
| Iceland                      | 81        | ▲ |
| Austria                      | 80        | ▲ |
| Norway                       | 80        | ▲ |
| Latvia (LSS)                 | 77        | ○ |
| Australia                    | 76        | ○ |
| Hungary                      | 76        | ○ |
| Ireland                      | 76        | ○ |
| Canada                       | 75        | ○ |
| Israel                       | 73        | ○ |
| England                      | 71        | ○ |
| Japan                        | 71        | ○ |
| Slovenia                     | 71        | ○ |
| <b>International average</b> | <b>71</b> |   |
| Cyprus                       | 69        | ○ |
| Scotland                     | 68        | ○ |
| United States                | 68        | ○ |
| New Zealand                  | 67        | ○ |
| Kuwait                       | 63        | ▼ |
| Iran, Islamic Rep.           | 57        | ▼ |
| Singapore                    | 57        | ▼ |
| Hong Kong                    | 56        | ▼ |
| Portugal                     | 56        | ▼ |
| Thailand                     | 29        | ▼ |

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

Item Number: N5

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>E</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

Where does baby chick get food

A baby chick grows inside an egg for 21 days before it hatches. Where does the baby chick get its food before it hatches?

- A. It is fed by the mother hen.
- B. It doesn't need any food.
- C. It makes its own food.
- D. It uses food stored in the egg.
- E. It eats the egg shell.

#### Overall Percent Correct

|               |    |   |
|---------------|----|---|
| Korea         | 72 | ▲ |
| Japan         | 67 | ▲ |
| Austria       | 62 | ▲ |
| Slovenia      | 60 | ▲ |
| Netherlands   | 55 | ▲ |
| New Zealand   | 50 | ○ |
| Iceland       | 48 | ○ |
| Greece        | 47 | ○ |
| Australia     | 44 | ○ |
| United States | 44 | ○ |

#### International average 43

|                    |    |   |
|--------------------|----|---|
| Canada             | 41 | ○ |
| Latvia (LSS)       | 41 | ○ |
| England            | 40 | ○ |
| Singapore          | 40 | ○ |
| Hungary            | 39 | ○ |
| Ireland            | 37 | ○ |
| Norway             | 37 | ○ |
| Scotland           | 36 | ○ |
| Thailand           | 36 | ○ |
| Hong Kong          | 35 | ▼ |
| Czech Republic     | 34 | ▼ |
| Kuwait             | 34 | ▼ |
| Iran, Islamic Rep. | 33 | ▼ |
| Israel             | 29 | ▼ |
| Portugal           | 28 | ▼ |
| Cyprus             | 27 | ▼ |

#### Country average vs. International average:

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

Item Number: N6

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

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

Why did seeds not sprout

John kept some seeds on moist cotton in a dish. Mike put the same kind of seeds in a dish beside John's dish, and covered them with water. After two days, John's seeds sprouted, but Mike's did not.

Which is the most likely reason?

- A. Mike's seeds needed more air.
- B. Mike's seeds needed more light.
- C. Mike did not put the dish in a warm enough place.
- D. Mike should have used a different kind of seed.

#### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 61        | ▲ |
| Netherlands                  | 58        | ▲ |
| Israel                       | 53        | ▲ |
| Czech Republic               | 50        | ○ |
| Hungary                      | 48        | ○ |
| New Zealand                  | 46        | ○ |
| United States                | 46        | ○ |
| Australia                    | 45        | ○ |
| Canada                       | 45        | ○ |
| Singapore                    | 45        | ○ |
| Latvia (LSS)                 | 44        | ○ |
| England                      | 43        | ○ |
| Iceland                      | 43        | ○ |
| Ireland                      | 43        | ○ |
| Norway                       | 42        | ○ |
| <b>International average</b> | <b>41</b> |   |
| Austria                      | 40        | ○ |
| Scotland                     | 39        | ○ |
| Portugal                     | 38        | ○ |
| Slovenia                     | 38        | ○ |
| Japan                        | 37        | ○ |
| Hong Kong                    | 36        | ○ |
| Cyprus                       | 31        | ▼ |
| Thailand                     | 25        | ▼ |
| Iran, Islamic Rep.           | 23        | ▼ |
| Greece                       | 22        | ▼ |
| Kuwait                       | 22        | ▼ |

#### Country average vs. International average:

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

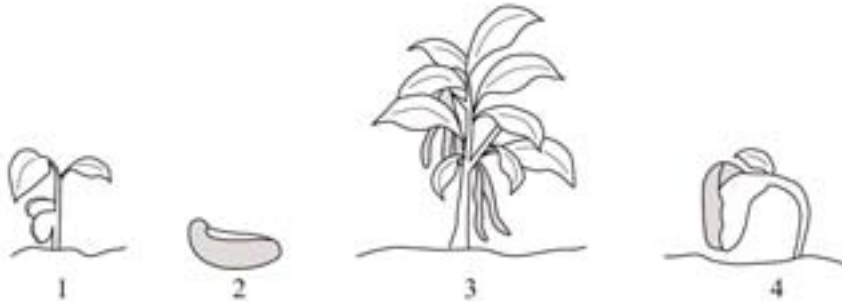
Item Number: O2

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

|                       |   |
|-----------------------|---|
| <b>Content Domain</b> | <b>Cognitive Domain</b>                 |
| <b>Life Science</b>   | <b>Understanding Simple Information</b> |

Stages of plant growth

The pictures show a bean plant at different stages of growth. (The pictures are not drawn on the same scale.)



In what order do these stages take place?

- A. 2, 1, 3, 4
- B. 2, 4, 1, 3
- C. 3, 2, 1, 4
- D. 4, 2, 3, 1
- E. 4, 3, 2, 1

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 97        | ▲ |
| Japan                        | 92        | ▲ |
| Singapore                    | 92        | ▲ |
| Hong Kong                    | 86        | ▲ |
| United States                | 81        | ▲ |
| Netherlands                  | 79        | ▲ |
| Australia                    | 78        | ▲ |
| Thailand                     | 78        | ▲ |
| Slovenia                     | 77        | ▲ |
| Czech Republic               | 76        | ○ |
| New Zealand                  | 74        | ○ |
| Canada                       | 72        | ○ |
| England                      | 70        | ○ |
| Austria                      | 69        | ○ |
| <b>International average</b> | <b>69</b> |   |
| Scotland                     | 65        | ○ |
| Ireland                      | 64        | ○ |
| Israel                       | 64        | ○ |
| Hungary                      | 61        | ○ |
| Cyprus                       | 60        | ▼ |
| Iceland                      | 60        | ○ |
| Greece                       | 55        | ▼ |
| Latvia (LSS)                 | 52        | ▼ |
| Norway                       | 52        | ▼ |
| Portugal                     | 52        | ▼ |
| Kuwait                       | 47        | ▼ |
| Iran, Islamic Rep.           | 33        | ▼ |

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: O3

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>B</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

Which animal produces milk

Which animal produces milk for its young?

A. Chicken

B. Frog

C. Monkey

D. Snake

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 96        | ▲ |
| Japan                        | 94        | ▲ |
| Czech Republic               | 92        | ▲ |
| Hungary                      | 91        | ▲ |
| Thailand                     | 85        | ▲ |
| Iran, Islamic Rep.           | 83        | ▲ |
| Slovenia                     | 83        | ▲ |
| Netherlands                  | 82        | ○ |
| Hong Kong                    | 81        | ▲ |
| Portugal                     | 77        | ○ |
| Singapore                    | 77        | ○ |
| Australia                    | 76        | ○ |
| <b>International average</b> | <b>75</b> |   |
| Latvia (LSS)                 | 74        | ○ |
| Greece                       | 73        | ○ |
| New Zealand                  | 73        | ○ |
| England                      | 72        | ○ |
| United States                | 71        | ○ |
| Canada                       | 70        | ○ |
| Ireland                      | 69        | ○ |
| Norway                       | 69        | ○ |
| Cyprus                       | 68        | ○ |
| Scotland                     | 66        | ▼ |
| Israel                       | 63        | ▼ |
| Austria                      | 60        | ▼ |
| Kuwait                       | 58        | ▼ |
| Iceland                      | 56        | ▼ |

### Country average vs. International average:


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



Item Number: O7



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


|                       |  |
|-----------------------|--|
| <b>Content Domain</b> | <b>Cognitive Domain</b>                  |
| <b>Life Science</b>   | <b>Understanding Complex Information</b> |

Adult stage of caterpillar

When this caterpillar  becomes an adult, what will it look like?

A  B 

C  D 

E 

| Overall Percent Correct      |           |   |
|------------------------------|-----------|---|
| Canada                       | 98        | ▲ |
| Hong Kong                    | 97        | ▲ |
| Netherlands                  | 97        | ▲ |
| Norway                       | 97        | ▲ |
| United States                | 97        | ▲ |
| Australia                    | 96        | ▲ |
| Czech Republic               | 96        | ▲ |
| England                      | 96        | ▲ |
| Japan                        | 95        | ▲ |
| New Zealand                  | 95        | ▲ |
| Austria                      | 94        | ▲ |
| Ireland                      | 94        | ▲ |
| Scotland                     | 94        | ▲ |
| Singapore                    | 94        | ▲ |
| Korea                        | 90        | ○ |
| Slovenia                     | 87        | ○ |
| Hungary                      | 85        | ○ |
| <b>International average</b> | <b>85</b> |   |
| Israel                       | 81        | ○ |
| Thailand                     | 76        | ○ |
| Iceland                      | 71        | ▼ |
| Iran, Islamic Rep.           | 69        | ▼ |
| Greece                       | 67        | ▼ |
| Cyprus                       | 64        | ▼ |
| Latvia (LSS)                 | 63        | ▼ |
| Portugal                     | 59        | ▼ |
| Kuwait                       | 45        | ▼ |

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

Item Number: P1

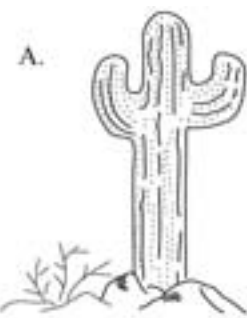
|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>B</b> |
|--------------------------|----------|




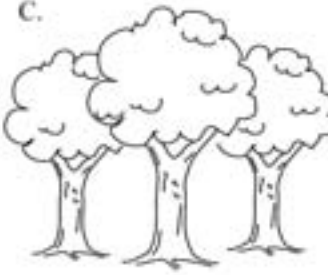
|                       |  |
|-----------------------|--|
| <b>Content Domain</b> | <b>Cognitive Domain</b>                  |
| <b>Life Science</b>   | <b>Understanding Complex Information</b> |


Plants found in very dry places

Which picture shows plants commonly found in a desert?

A. 

B. 

C. 

D. 

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Hong Kong                    | 97        | ▲ |
| Canada                       | 96        | ▲ |
| Korea                        | 96        | ▲ |
| Austria                      | 95        | ▲ |
| Norway                       | 95        | ▲ |
| United States                | 95        | ▲ |
| Japan                        | 94        | ▲ |
| Netherlands                  | 94        | ▲ |
| Australia                    | 92        | ○ |
| Czech Republic               | 91        | ○ |
| England                      | 91        | ○ |
| Latvia (LSS)                 | 91        | ○ |
| Scotland                     | 91        | ○ |
| Iceland                      | 89        | ○ |
| Ireland                      | 89        | ○ |
| New Zealand                  | 89        | ○ |
| Slovenia                     | 89        | ○ |
| <b>International average</b> | <b>88</b> |   |
| Greece                       | 86        | ○ |
| Cyprus                       | 84        | ○ |
| Thailand                     | 83        | ○ |
| Hungary                      | 82        | ○ |
| Israel                       | 80        | ▼ |
| Portugal                     | 78        | ▼ |
| Kuwait                       | 76        | ▼ |
| Singapore                    | 76        | ▼ |
| Iran, Islamic Rep.           | 56        | ▼ |

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

Item Number: P2

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>A</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

Birds different from insects

Birds are different from insects in that birds have

- A. wings
- B. legs
- C. eyes
- D. eggs
- E. feathers

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Hungary                      | 95        | ▲ |
| Czech Republic               | 77        | ▲ |
| Japan                        | 77        | ▲ |
| Australia                    | 76        | ▲ |
| Canada                       | 73        | ▲ |
| Singapore                    | 73        | ▲ |
| Austria                      | 71        | ▲ |
| New Zealand                  | 69        | ▲ |
| United States                | 69        | ▲ |
| Scotland                     | 67        | ○ |
| Korea                        | 65        | ○ |
| Norway                       | 64        | ○ |
| England                      | 63        | ○ |
| Ireland                      | 63        | ○ |
| <b>International average</b> | <b>60</b> |   |
| Greece                       | 59        | ○ |
| Kuwait                       | 58        | ○ |
| Thailand                     | 58        | ○ |
| Netherlands                  | 57        | ○ |
| Iceland                      | 55        | ○ |
| Latvia (LSS)                 | 46        | ▼ |
| Portugal                     | 43        | ▼ |
| Slovenia                     | 42        | ▼ |
| Hong Kong                    | 41        | ▼ |
| Israel                       | 41        | ▼ |
| Iran, Islamic Rep.           | 29        | ▼ |
| Cyprus                       | 28        | ▼ |

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

Item Number: P8

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>E</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

## Seeds in plants

|   |
|---|
| Seeds develop from which part of a plant? |
| A. Flower                                 |
| B. Leaf                                   |
| C. Root                                   |
| D. Stem                                   |

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Czech Republic               | 79        | ▲ |
| Austria                      | 71        | ▲ |
| Thailand                     | 69        | ▲ |
| Japan                        | 68        | ▲ |
| Slovenia                     | 68        | ▲ |
| Latvia (LSS)                 | 66        | ▲ |
| Hungary                      | 65        | ▲ |
| Singapore                    | 64        | ▲ |
| Hong Kong                    | 62        | ▲ |
| Korea                        | 55        | ▲ |
| Netherlands                  | 46        | ○ |
| <b>International average</b> | <b>46</b> |   |
| Israel                       | 45        | ○ |
| Cyprus                       | 44        | ○ |
| Australia                    | 38        | ○ |
| Greece                       | 37        | ○ |
| United States                | 37        | ▼ |
| England                      | 35        | ▼ |
| Canada                       | 33        | ▼ |
| New Zealand                  | 33        | ▼ |
| Norway                       | 33        | ▼ |
| Iceland                      | 29        | ▼ |
| Scotland                     | 26        | ▼ |
| Iran, Islamic Rep.           | 23        | ▼ |
| Ireland                      | 22        | ▼ |
| Kuwait                       | 22        | ▼ |
| Portugal                     | 20        | ▼ |

Country average vs.  
International average:

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

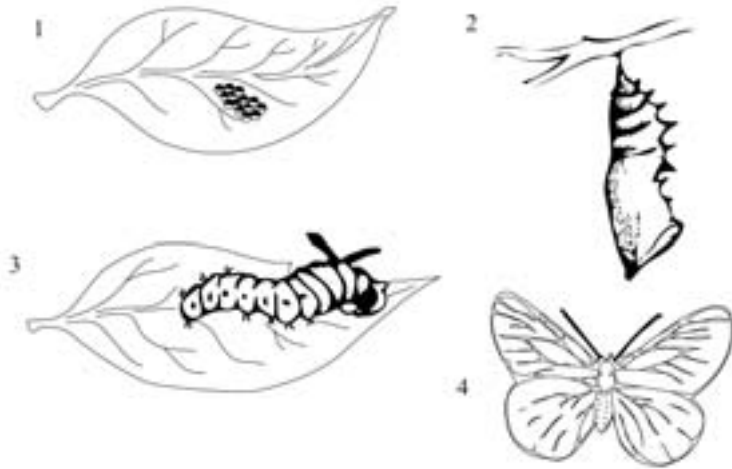
Item Number: P9

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

|                       |   |
|-----------------------|---|
| <b>Content Domain</b> | <b>Cognitive Domain</b>                 |
| <b>Life Science</b>   | <b>Understanding Simple Information</b> |

Changes in butterfly eggs

A butterfly sitting on a leaf laid some small eggs. The pictures show the changes that took place to the eggs.



In what order did the changes take place?

- A. 1, 2, 3, 4
- B. 1, 3, 2, 4
- C. 1, 4, 3, 2
- D. 1, 4, 2, 3

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 92        | ▲ |
| Netherlands                  | 86        | ▲ |
| Korea                        | 85        | ▲ |
| Hong Kong                    | 82        | ▲ |
| Australia                    | 81        | ▲ |
| United States                | 80        | ▲ |
| Canada                       | 79        | ▲ |
| Czech Republic               | 79        | ▲ |
| New Zealand                  | 76        | ▲ |
| England                      | 73        | ○ |
| Singapore                    | 73        | ▲ |
| Scotland                     | 72        | ○ |
| Austria                      | 70        | ○ |
| Hungary                      | 67        | ○ |
| Norway                       | 67        | ○ |
| Ireland                      | 65        | ○ |
| <b>International average</b> | <b>64</b> |   |
| Greece                       | 57        | ○ |
| Slovenia                     | 56        | ○ |
| Latvia (LSS)                 | 54        | ▼ |
| Cyprus                       | 53        | ▼ |
| Israel                       | 51        | ▼ |
| Iceland                      | 49        | ▼ |
| Portugal                     | 44        | ▼ |
| Thailand                     | 33        | ▼ |
| Kuwait                       | 31        | ▼ |
| Iran, Islamic Rep.           | 19        | ▼ |

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: Q1

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>B</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

## Why eat fruits and vegetables

What is the BEST reason for including fruits and leafy vegetables in a healthy diet?

- A. They have a high water content.
- B. They are the best source of protein.
- C. They are rich in minerals and vitamins.
- D. They are the best source of carbohydrates.

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Netherlands                  | 93        | ▲ |
| Austria                      | 92        | ▲ |
| Czech Republic               | 83        | ▲ |
| Hungary                      | 82        | ▲ |
| Slovenia                     | 80        | ▲ |
| Korea                        | 79        | ▲ |
| Norway                       | 77        | ▲ |
| Hong Kong                    | 74        | ▲ |
| Latvia (LSS)                 | 73        | ○ |
| Israel                       | 72        | ○ |
| Singapore                    | 72        | ▲ |
| <b>International average</b> | <b>65</b> |   |
| Iceland                      | 65        | ○ |
| Japan                        | 64        | ○ |
| Ireland                      | 62        | ○ |
| United States                | 62        | ○ |
| Scotland                     | 59        | ○ |
| Canada                       | 58        | ○ |
| England                      | 58        | ○ |
| Australia                    | 57        | ○ |
| Portugal                     | 57        | ○ |
| New Zealand                  | 55        | ▼ |
| Greece                       | 46        | ▼ |
| Kuwait                       | 45        | ▼ |
| Thailand                     | 45        | ▼ |
| Cyprus                       | 44        | ▼ |
| Iran, Islamic Rep.           | 39        | ▼ |

Country average vs.  
International average:

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

Item Number: Q2

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

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

Animal breathes faster

When an animal breathes faster and its heart beats faster, the animal is MOST likely

A. cold

B. frightened

C. resting

D. sleeping

Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Hong Kong                    | 87        | ▲ |
| United States                | 80        | ▲ |
| Cyprus                       | 79        | ○ |
| Slovenia                     | 79        | ○ |
| Australia                    | 78        | ○ |
| Austria                      | 77        | ○ |
| England                      | 77        | ○ |
| Latvia (LSS)                 | 77        | ○ |
| Singapore                    | 77        | ○ |
| Canada                       | 75        | ○ |
| Czech Republic               | 75        | ○ |
| Greece                       | 75        | ○ |
| Netherlands                  | 75        | ○ |
| New Zealand                  | 74        | ○ |
| Norway                       | 74        | ○ |
| Japan                        | 73        | ○ |
| Korea                        | 73        | ○ |
| Scotland                     | 73        | ○ |
| <b>International average</b> | <b>73</b> |   |
| Ireland                      | 72        | ○ |
| Iceland                      | 71        | ○ |
| Iran, Islamic Rep.           | 71        | ○ |
| Israel                       | 69        | ○ |
| Hungary                      | 68        | ○ |
| Portugal                     | 59        | ▼ |
| Thailand                     | 58        | ▼ |
| Kuwait                       | 52        | ▼ |

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


Item Number: Q5


|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|


| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |


Which is not an insect

Which picture does NOT show an insect?

A.   
Butterfly

B.   
Grasshopper

C.   
Spider

D.   
Ant

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 81        | ▲ |
| Japan                        | 77        | ▲ |
| Singapore                    | 67        | ▲ |
| Australia                    | 63        | ▲ |
| United States                | 62        | ▲ |
| Hong Kong                    | 61        | ▲ |
| Canada                       | 59        | ▲ |
| New Zealand                  | 53        | ▲ |
| Netherlands                  | 45        | ○ |
| Scotland                     | 44        | ○ |
| Austria                      | 43        | ○ |
| England                      | 43        | ○ |
| <b>International average</b> | <b>43</b> |   |
| Ireland                      | 40        | ○ |
| Greece                       | 39        | ○ |
| Slovenia                     | 39        | ○ |
| Kuwait                       | 38        | ○ |
| Cyprus                       | 37        | ○ |
| Norway                       | 34        | ○ |
| Czech Republic               | 32        | ▼ |
| Hungary                      | 31        | ▼ |
| Portugal                     | 26        | ▼ |
| Iran, Islamic Rep.           | 22        | ▼ |
| Israel                       | 21        | ▼ |
| Iceland                      | 20        | ▼ |
| Latvia (LSS)                 | 19        | ▼ |
| Thailand                     | 10        | ▼ |

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

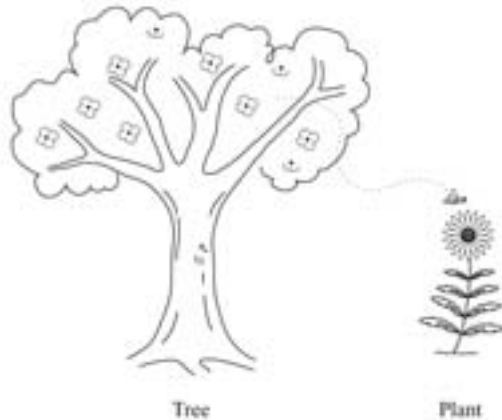
Item Number: Q6

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>C</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

## Insect carries pollen

The picture shows how an insect can carry pollen from the flowers of a tree to the flowers of a small plant.



What will most likely happen?

- A. The offspring from the tree will look like the plant.
- B. The offspring from the plant will look like the tree.
- C. The offspring from the plant will look like the tree and the plant.
- D. Nothing will happen because no offspring will be produced.

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Czech Republic               | 79        | ▲ |
| Slovenia                     | 79        | ▲ |
| Hungary                      | 76        | ▲ |
| Austria                      | 72        | ▲ |
| Ireland                      | 72        | ▲ |
| England                      | 67        | ▲ |
| New Zealand                  | 66        | ▲ |
| Australia                    | 62        | ○ |
| Norway                       | 62        | ○ |
| Scotland                     | 60        | ○ |
| United States                | 60        | ○ |
| Canada                       | 59        | ○ |
| Israel                       | 57        | ○ |
| Latvia (LSS)                 | 57        | ○ |
| Netherlands                  | 57        | ○ |
| Portugal                     | 57        | ○ |
| <b>International average</b> | <b>55</b> |   |
| Greece                       | 55        | ○ |
| Iceland                      | 54        | ○ |
| Iran, Islamic Rep.           | 48        | ○ |
| Singapore                    | 41        | ▼ |
| Cyprus                       | 40        | ▼ |
| Korea                        | 36        | ▼ |
| Hong Kong                    | 35        | ▼ |
| Kuwait                       | 34        | ▼ |
| Thailand                     | 27        | ▼ |
| Japan                        | 22        | ▼ |

## Country average vs. International average:

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

Item Number: R3

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



| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

## Why use sunscreen

What is the MOST important reason for people to use a sun-screen when they are outside in sunlight?

- A. It protects the skin against dangerous rays from the sun.
- B. It makes the skin more tanned.
- C. It makes the skin smooth.
- D. It makes the skin feel cooler.

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Australia                    | 93        | ▲ |
| Ireland                      | 90        | ▲ |
| Czech Republic               | 89        | ▲ |
| England                      | 87        | ▲ |
| Canada                       | 85        | ▲ |
| Hong Kong                    | 85        | ▲ |
| Norway                       | 85        | ▲ |
| Slovenia                     | 85        | ▲ |
| Austria                      | 83        | ○ |
| Israel                       | 83        | ○ |
| Korea                        | 83        | ▲ |
| Netherlands                  | 83        | ○ |
| United States                | 83        | ▲ |
| New Zealand                  | 81        | ○ |
| Scotland                     | 80        | ○ |
| Portugal                     | 77        | ○ |
| Cyprus                       | 76        | ○ |
| <b>International average</b> | <b>76</b> |   |
| Iceland                      | 74        | ○ |
| Singapore                    | 74        | ○ |
| Hungary                      | 69        | ○ |
| Greece                       | 68        | ○ |
| Thailand                     | 63        | ▼ |
| Japan                        | 61        | ▼ |
| Kuwait                       | 53        | ▼ |
| Latvia (LSS)                 | 51        | ▼ |
| Iran, Islamic Rep.           | 28        | ▼ |

## Country average vs. International average:

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

Item Number: R4

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

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

Which animal has backbone

Which one of these groups contains only animals with a backbone (vertebrates)?

A. Earthworm, snake, crayfish

B. Spider, clam, dragonfly

C. Crayfish, snake, horse

D. Clam, fish, earthworm

E. Horse, snake, fish

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Thailand                     | 74        | ▲ |
| Hungary                      | 64        | ▲ |
| Czech Republic               | 63        | ▲ |
| Greece                       | 61        | ▲ |
| United States                | 55        | ▲ |
| Kuwait                       | 54        | ▲ |
| Australia                    | 53        | ○ |
| Korea                        | 51        | ○ |
| Canada                       | 50        | ○ |
| Cyprus                       | 50        | ○ |
| New Zealand                  | 50        | ○ |
| England                      | 47        | ○ |
| Ireland                      | 47        | ○ |
| Japan                        | 47        | ○ |
| Netherlands                  | 47        | ○ |
| <b>International average</b> | <b>45</b> |   |
| Singapore                    | 42        | ○ |
| Slovenia                     | 41        | ○ |
| Iceland                      | 40        | ○ |
| Portugal                     | 40        | ○ |
| Scotland                     | 40        | ○ |
| Norway                       | 33        | ▼ |
| Austria                      | 31        | ▼ |
| Iran, Islamic Rep.           | 31        | ▼ |
| Latvia (LSS)                 | 30        | ▼ |
| Hong Kong                    | 22        | ▼ |
| Israel                       | 19        | ▼ |

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

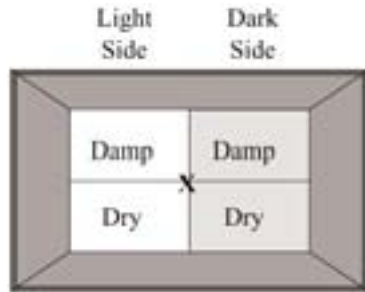
Item Number: R6

|                   |   |
|-------------------|---|
| Correct Response: | E |
|-------------------|---|

| Content Domain | Cognitive Domain                                       |
|----------------|--|
| Life Science   | Using Tools, Routine Procedures, and Science Processes |

## Worm in box

Here is a picture of the inside of a box. If you put a worm on the X on the bottom of the box, to which corner would you expect it to go?



- A. Damp and light
- B. Dry and light
- C. Damp and dark
- D. Dry and dark

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 92        | ▲ |
| Japan                        | 79        | ▲ |
| Austria                      | 73        | ▲ |
| Netherlands                  | 73        | ▲ |
| Australia                    | 68        | ▲ |
| England                      | 68        | ▲ |
| Czech Republic               | 66        | ▲ |
| Slovenia                     | 63        | ○ |
| Canada                       | 62        | ○ |
| New Zealand                  | 62        | ○ |
| Israel                       | 60        | ○ |
| Scotland                     | 60        | ○ |
| United States                | 59        | ○ |
| Latvia (LSS)                 | 58        | ○ |
| Hong Kong                    | 56        | ○ |
| <b>International average</b> | <b>56</b> |   |
| Hungary                      | 55        | ○ |
| Ireland                      | 54        | ○ |
| Iceland                      | 53        | ○ |
| Norway                       | 53        | ○ |
| Singapore                    | 48        | ▼ |
| Portugal                     | 37        | ▼ |
| Cyprus                       | 35        | ▼ |
| Greece                       | 30        | ▼ |
| Iran, Islamic Rep.           | 28        | ▼ |
| Kuwait                       | 26        | ▼ |
| Thailand                     | 26        | ▼ |

## Country average vs. International average:

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

Item Number: R7

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

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

### Function of the heart

Write down one thing your heart does that helps the other parts of your body.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Australia                    | 69        | ▲ |
| United States                | 64        | ▲ |
| England                      | 61        | ▲ |
| Singapore                    | 59        | ▲ |
| Austria                      | 57        | ▲ |
| New Zealand                  | 53        | ▲ |
| Scotland                     | 53        | ▲ |
| Norway                       | 51        | ▲ |
| Canada                       | 49        | ▲ |
| Ireland                      | 49        | ▲ |
| Slovenia                     | 49        | ▲ |
| <b>International average</b> | <b>40</b> |   |
| Japan                        | 39        | ○ |
| Israel                       | 37        | ○ |
| Netherlands                  | 36        | ○ |
| Czech Republic               | 35        | ○ |
| Greece                       | 34        | ○ |
| Korea                        | 34        | ○ |
| Iceland                      | 33        | ○ |
| Latvia (LSS)                 | 33        | ○ |
| Hungary                      | 30        | ▼ |
| Portugal                     | 27        | ▼ |
| Iran, Islamic Rep.           | 23        | ▼ |
| Cyprus                       | 18        | ▼ |
| Hong Kong                    | 14        | ▼ |
| Thailand                     | 13        | ▼ |
| Kuwait                       | 12        | ▼ |

#### Country average vs. International average:

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

Item Number: W2

## SCORING

### Correct Response

- Explanation includes pumping blood in a circulating system out to the body and back to the heart.
- Explanation includes pumping blood to all parts of the body.  
*Examples: It pumps blood and gives air to your lungs.  
It pumps blood to the other parts of your body.  
It pumps your blood.  
It pumps your blood around your body.*
- Other correct.

### Incorrect Response

- Refers to heart keeping us alive or similar expression.  
*Examples: Your heart gives you energy.  
Your heart gives you the strength to grow.  
It helps me breathe.*
- Refers to heart keeping the beat.
- Other incorrect.

| Content Domain | Cognitive Domain                            |
|----------------|---|
| Life Science   | Theorizing, Analyzing, and Solving Problems |

### Thirst on a hot day

Write down the reason why we get thirsty on a hot day and have to drink a lot.

Item Number: W3

### SCORING

#### Correct Response

- Refers to perspiration and its cooling effect and the need to replace lost water.
- Refers to perspiration and only to replacement of lost water.  
*Example: Because when we are hot, our body opens the pores on our skin and we lose a lot of salt and liquid.*
- Refers to perspiration and only its cooling effect.
- Refers to perspiration only.  
*Examples: We are sweating.  
Your body gives away much water.  
We are sweating and get drier.*
- Other acceptable.

#### Incorrect Response

- Refers to body temperature (being too hot) but does not answer why we get thirsty.  
*Example: You cool down by drinking something cold.*
- Refers only to drying of the body.  
*Examples: Your throat/mouth gets dry.  
You get drier.  
The heat dries everything.*
- Refers to getting more energy by drinking more water.  
*Example: You get exhausted.*
- Merely repeats the information in the stem.  
*Examples: Because it is hot.  
You need water.*
- Other incorrect:  
*Example: You lose salt.*

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Slovenia                     | 44        | ▲ |
| Korea                        | 43        | ▲ |
| Singapore                    | 43        | ▲ |
| Hong Kong                    | 41        | ▲ |
| Japan                        | 37        | ▲ |
| Israel                       | 36        | ▲ |
| Austria                      | 35        | ○ |
| Canada                       | 33        | ▲ |
| Czech Republic               | 33        | ○ |
| Scotland                     | 32        | ○ |
| Norway                       | 30        | ○ |
| United States                | 29        | ○ |
| Australia                    | 28        | ○ |
| England                      | 28        | ○ |
| Netherlands                  | 28        | ○ |
| <b>International average</b> | <b>27</b> |   |
| Greece                       | 25        | ○ |
| Ireland                      | 22        | ○ |
| Latvia (LSS)                 | 21        | ○ |
| New Zealand                  | 21        | ▼ |
| Cyprus                       | 19        | ▼ |
| Hungary                      | 17        | ▼ |
| Iran, Islamic Rep.           | 15        | ▼ |
| Portugal                     | 14        | ▼ |
| Iceland                      | 13        | ▼ |
| Thailand                     | 13        | ▼ |
| Kuwait                       | 12        | ▼ |

#### Country average vs. International average:

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

| Content Domain | Cognitive Domain                            |
|----------------|---|
| Life Science   | Theorizing, Analyzing, and Solving Problems |

## Human skull

The human brain is inside the skull. Write down one advantage of the skull being thick and strong.

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 80        | ▲ |
| Japan                        | 71        | ▲ |
| Hong Kong                    | 70        | ▲ |
| Australia                    | 66        | ▲ |
| Singapore                    | 66        | ▲ |
| Austria                      | 65        | ▲ |
| Netherlands                  | 60        | ▲ |
| United States                | 58        | ▲ |
| Scotland                     | 56        | ○ |
| England                      | 55        | ○ |
| New Zealand                  | 53        | ○ |
| Czech Republic               | 52        | ○ |
| Greece                       | 52        | ○ |
| Israel                       | 52        | ○ |
| <b>International average</b> | <b>51</b> |   |
| Ireland                      | 49        | ○ |
| Canada                       | 48        | ○ |
| Hungary                      | 48        | ○ |
| Thailand                     | 47        | ○ |
| Slovenia                     | 46        | ○ |
| Norway                       | 43        | ▼ |
| Latvia (LSS)                 | 41        | ▼ |
| Cyprus                       | 38        | ▼ |
| Iceland                      | 38        | ▼ |
| Iran, Islamic Rep.           | 33        | ▼ |
| Portugal                     | 24        | ▼ |
| Kuwait                       | 13        | ▼ |

Country average vs.  
International average:

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

Item Number: W4

## SCORING

## Correct Response

- Refers to protection against concussion and injuries of the brain.  
*Example: It protects the brain. [or thoughts, memory...]*
- Refers to protection of the "head."  
*Examples: It does not break as easily.  
The head can withstand more.*
- Explanation includes other correct "advantages."

## Incorrect Response

- Repeats information given in the stem.  
*Examples: The skull is so hard.  
Its so thick it makes it strong.*
- Other incorrect.

| Content Domain | Cognitive Domain                            |
|----------------|---|
| Life Science   | Theorizing, Analyzing, and Solving Problems |

### Animals and plants

Write down one reason why animals could NOT live in a world without plants.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 91        | ▲ |
| Korea                        | 88        | ▲ |
| Netherlands                  | 88        | ▲ |
| Australia                    | 87        | ▲ |
| Slovenia                     | 87        | ▲ |
| England                      | 85        | ▲ |
| Singapore                    | 85        | ▲ |
| Israel                       | 84        | ▲ |
| Austria                      | 83        | ▲ |
| United States                | 83        | ▲ |
| Ireland                      | 80        | ○ |
| Czech Republic               | 79        | ○ |
| Norway                       | 79        | ○ |
| Canada                       | 78        | ○ |
| Latvia (LSS)                 | 77        | ○ |
| New Zealand                  | 77        | ○ |
| Scotland                     | 77        | ○ |
| <b>International average</b> | <b>77</b> |   |
| Hungary                      | 74        | ○ |
| Hong Kong                    | 71        | ▼ |
| Cyprus                       | 70        | ▼ |
| Greece                       | 70        | ▼ |
| Iceland                      | 70        | ▼ |
| Portugal                     | 68        | ▼ |
| Iran, Islamic Rep.           | 60        | ▼ |
| Thailand                     | 57        | ▼ |
| Kuwait                       | 44        | ▼ |

### Country average vs. International average:

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

Item Number: X2

## SCORING

### Correct Response

- Shows some understanding of food chain.  
*Example: Some animals need plants to eat and others depend on eating the animals.*
- Mentions that plants are generally needed for food.  
*Example: Animals eat plants.*
- Refers to plants "producing oxygen" or "cleaning the air".  
*Examples: If there were no plants, animals couldn't breathe. Plants give them air.*
- Some combination of the above.
- Other acceptable:  
*Example: Plants give animals shelter and a home.*

### Incorrect Response

- Merely repeats information from the stem.  
*Example: Plants are needed.*
- Other incorrect.

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

Stages in frog's growth

The pictures show different stages in a frog's growth.

Write the letters in the boxes to show the pictures in the order of the frog's growth.

Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 97        | ▲ |
| Netherlands                  | 97        | ▲ |
| Austria                      | 95        | ▲ |
| Hong Kong                    | 95        | ▲ |
| Singapore                    | 95        | ▲ |
| Australia                    | 94        | ▲ |
| Korea                        | 94        | ▲ |
| United States                | 94        | ▲ |
| Canada                       | 92        | ▲ |
| England                      | 91        | ▲ |
| Czech Republic               | 90        | ▲ |
| Ireland                      | 89        | ▲ |
| Slovenia                     | 89        | ▲ |
| Hungary                      | 87        | ▲ |
| Scotland                     | 87        | ○ |
| New Zealand                  | 85        | ○ |
| Norway                       | 84        | ○ |
| <b>International average</b> | <b>83</b> |   |
| Greece                       | 79        | ○ |
| Israel                       | 79        | ○ |
| Latvia (LSS)                 | 77        | ○ |
| Thailand                     | 75        | ▼ |
| Cyprus                       | 71        | ▼ |
| Iceland                      | 71        | ▼ |
| Kuwait                       | 64        | ▼ |
| Portugal                     | 62        | ▼ |
| Iran, Islamic Rep.           | 16        | ▼ |

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

Item Number: X4

**SCORING**

**Correct Response**

- ZWYX.

**Incorrect Response**

- Any other order.



| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

In which group do fish belong

This chart shows four groups of animals. In which group do fish belong?

|                     |             |              |
|---------------------|-------------|--------------|
|                     | Land Animal | Water Animal |
| Does have bones     | A           | B            |
| Does not have bones | C           | D            |

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 88        | ▲ |
| Korea                        | 82        | ▲ |
| Singapore                    | 79        | ▲ |
| Slovenia                     | 76        | ▲ |
| Czech Republic               | 71        | ▲ |
| Australia                    | 69        | ▲ |
| Hungary                      | 65        | ○ |
| England                      | 63        | ○ |
| Hong Kong                    | 63        | ○ |
| Greece                       | 61        | ○ |
| Ireland                      | 61        | ○ |
| New Zealand                  | 61        | ○ |
| Norway                       | 61        | ○ |
| United States                | 59        | ○ |
| <b>International average</b> | <b>59</b> |   |
| Canada                       | 57        | ○ |
| Cyprus                       | 57        | ○ |
| Latvia (LSS)                 | 56        | ○ |
| Scotland                     | 56        | ○ |
| Iceland                      | 53        | ○ |
| Thailand                     | 52        | ○ |
| Kuwait                       | 47        | ▼ |
| Netherlands                  | 47        | ▼ |
| Austria                      | 44        | ▼ |
| Israel                       | 43        | ▼ |
| Iran, Islamic Rep.           | 36        | ▼ |
| Portugal                     | 27        | ▼ |

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

Item Number: X5

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>B</b> |
|--------------------------|----------|

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

### Changes in children's bodies: one change

Write down two changes that occur in children's bodies as they become adults.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 91        | ▲ |
| Japan                        | 90        | ▲ |
| Netherlands                  | 86        | ▲ |
| Austria                      | 79        | ▲ |
| Norway                       | 76        | ▲ |
| Australia                    | 75        | ▲ |
| United States                | 74        | ▲ |
| Ireland                      | 73        | ▲ |
| Canada                       | 70        | ▲ |
| England                      | 70        | ▲ |
| Scotland                     | 70        | ○ |
| Hong Kong                    | 67        | ○ |
| Singapore                    | 67        | ○ |
| Israel                       | 66        | ○ |
| Greece                       | 65        | ○ |
| Iceland                      | 64        | ○ |
| New Zealand                  | 64        | ○ |
| <b>International average</b> | <b>64</b> |   |
| Hungary                      | 58        | ○ |
| Slovenia                     | 55        | ▼ |
| Portugal                     | 54        | ▼ |
| Czech Republic               | 53        | ▼ |
| Latvia (LSS)                 | 53        | ▼ |
| Cyprus                       | 52        | ▼ |
| Kuwait                       | 37        | ▼ |
| Thailand                     | 37        | ▼ |
| Iran, Islamic Rep.           | 17        | ▼ |

Item Number: Y2A

### SCORING

Note: Each of the two ways must be scored separately.

If the ways described are essentially the same, the second should be scored as incorrect.

#### Correct Response

- Refers to growth such as increases in height, weight, strength....  
*Example: They get bigger.*
- Refers to sexual maturation. Explanation may include secondary sexual features such as voice, hair....
- Refers to appearance.  
*Examples: Their nails grow.*  
*Their hair might darken.*
- Other acceptable:  
*Example: They lose teeth.*

#### Incorrect Response

- Refers to emotional or intellectual changes.  
*Examples: They don't cry.*  
*Their minds expand in intelligence.*
- Refers to social changes.  
*Examples: They can decide more themselves.*  
*They wear fashion clothes.*
- Refers to changes associated with aging such as losing hair.
- Repeats information in the question, such as referring to children becoming adults.  
*Example: They get older.*
- Other incorrect.  
*Example: Bones.*

#### Country average vs. International average:

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

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

### Changes in children's bodies: two changes

Write down two changes that occur in children's bodies as they become adults.

Item Number: Y2B

### SCORING

Note: Each of the two ways must be scored separately.

If the ways described are essentially the same, the second should be scored as incorrect.

#### Correct Response

- Refers to growth such as increases in height, weight, strength....  
*Example: They get bigger.*
- Refers to sexual maturation. Explanation may include secondary sexual features such as voice, hair....
- Refers to appearance.  
*Examples: Their nails grow.  
Their hair might darken.*
- Other acceptable:  
*Example: They lose teeth.*

#### Incorrect Response

- Refers to emotional or intellectual changes.  
*Examples: They don't cry.  
Their minds expand in intelligence.*
- Refers to social changes.  
*Examples: They can decide more themselves.  
They wear fashion clothes.*
- Refers to changes associated with aging such as losing hair.
- Repeats information in the question, such as referring to children becoming adults.  
*Example: They get older.*
- Other incorrect.  
*Example: Bones.*

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 60        | ▲ |
| Netherlands                  | 60        | ▲ |
| Austria                      | 59        | ▲ |
| Norway                       | 53        | ▲ |
| United States                | 53        | ▲ |
| Hong Kong                    | 51        | ▲ |
| Singapore                    | 51        | ▲ |
| Australia                    | 50        | ▲ |
| Hungary                      | 49        | ▲ |
| Canada                       | 48        | ▲ |
| Ireland                      | 46        | ○ |
| Scotland                     | 43        | ○ |
| England                      | 42        | ○ |
| Israel                       | 42        | ○ |
| <b>International average</b> | <b>39</b> |   |
| Iceland                      | 38        | ○ |
| New Zealand                  | 37        | ○ |
| Greece                       | 33        | ○ |
| Czech Republic               | 32        | ▼ |
| Cyprus                       | 28        | ▼ |
| Slovenia                     | 25        | ▼ |
| Thailand                     | 23        | ▼ |
| Japan                        | 22        | ▼ |
| Portugal                     | 22        | ▼ |
| Kuwait                       | 21        | ▼ |
| Latvia (LSS)                 | 18        | ▼ |
| Iran, Islamic Rep.           | 10        | ▼ |

#### Country average vs. International average:

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

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

Ways animals protect themselves: one way

One way for animals to protect themselves is by escaping (running, flying, or swimming away). What are two other ways they protect themselves?

Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 92        | ▲ |
| Netherlands                  | 83        | ▲ |
| Korea                        | 80        | ▲ |
| United States                | 77        | ▲ |
| Australia                    | 75        | ▲ |
| Canada                       | 72        | ▲ |
| Singapore                    | 69        | ▲ |
| England                      | 67        | ▲ |
| Ireland                      | 67        | ▲ |
| Slovenia                     | 67        | ▲ |
| Israel                       | 66        | ○ |
| Norway                       | 65        | ○ |
| New Zealand                  | 64        | ○ |
| Scotland                     | 64        | ○ |
| Czech Republic               | 62        | ○ |
| Austria                      | 61        | ○ |
| Greece                       | 61        | ○ |
| Hong Kong                    | 61        | ○ |
| <b>International average</b> | <b>60</b> |   |
| Latvia (LSS)                 | 60        | ○ |
| Iceland                      | 48        | ▼ |
| Portugal                     | 47        | ▼ |
| Hungary                      | 43        | ▼ |
| Cyprus                       | 38        | ▼ |
| Iran, Islamic Rep.           | 35        | ▼ |
| Kuwait                       | 28        | ▼ |
| Thailand                     | 20        | ▼ |

Item Number: Y3A

**SCORING**

Note: Each of the two ways must be scored separately.

If the ways described are essentially the same, the second should be scored as incorrect.

**Correct Response**

- Response includes general action such as defense, attack, fight.  
*Example: It can fight the animal.*
- Response includes specific examples of offensive actions such as biting, scratching, goring, frightening, making noise.
- Response includes specific examples of defensive actions such as camouflage or hiding, blending in, staying still, acting dead, etc.
- Response includes structural features of the animal used in defense such as spines, shell, smell, being poisonous, and tasting bad.
- Other acceptable:  
*Example: Use their special weapons.*

**Incorrect Response**

- Response repeats information in the question or adds other ways of escaping.  
*Examples: Flying away  
                  Jumping away  
                  Climbing trees.*
- Other incorrect.

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

| Content Domain | Cognitive Domain                  |
|----------------|-----------------------------------|
| Life Science   | Understanding Complex Information |

### Ways animals protect themselves: two ways

One way for animals to protect themselves is by escaping (running, flying, or swimming away). What are two other ways they protect themselves?

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| United States                | 64        | ▲ |
| Australia                    | 63        | ▲ |
| Netherlands                  | 61        | ▲ |
| Canada                       | 56        | ▲ |
| Ireland                      | 53        | ▲ |
| Israel                       | 52        | ▲ |
| Singapore                    | 52        | ▲ |
| New Zealand                  | 51        | ▲ |
| Norway                       | 50        | ▲ |
| Korea                        | 49        | ▲ |
| Hong Kong                    | 47        | ○ |
| Scotland                     | 47        | ○ |
| England                      | 46        | ○ |
| Czech Republic               | 44        | ○ |
| <b>International average</b> | <b>42</b> |   |
| Austria                      | 41        | ○ |
| Slovenia                     | 41        | ○ |
| Hungary                      | 37        | ○ |
| Iceland                      | 36        | ○ |
| Greece                       | 35        | ○ |
| Latvia (LSS)                 | 35        | ○ |
| Japan                        | 31        | ▼ |
| Iran, Islamic Rep.           | 25        | ▼ |
| Cyprus                       | 23        | ▼ |
| Kuwait                       | 15        | ▼ |
| Portugal                     | 14        | ▼ |
| Thailand                     | 11        | ▼ |

Item Number: Y3B

### SCORING

Note: Each of the two ways must be scored separately.

If the ways described are essentially the same, the second should be scored as incorrect.

### Correct Response

- Response includes general action such as defense, attack, fight.  
*Example: It can fight the animal.*
- Response includes specific examples of offensive actions such as biting, scratching, goring, frightening, making noise.
- Response includes specific examples of defensive actions such as camouflage or hiding, blending in, staying still, acting dead, etc.
- Response includes structural features of the animal used in defense such as spines, shell, smell, being poisonous, and tasting bad.
- Other acceptable:  
*Example: Use their special weapons.*

### Incorrect Response

- Response repeats information in the question or adds other ways of escaping.  
*Examples: Flying away*  
*Jumping away*  
*Climbing trees.*
- Other incorrect.

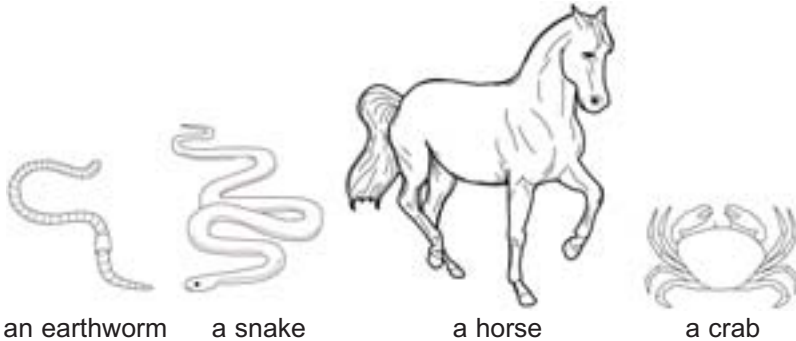
### Country average vs. International average:

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

| Content Domain | Cognitive Domain                 |
|----------------|----------------------------------|
| Life Science   | Understanding Simple Information |

## Structural features of animals

Use the pictures to answer the questions. (Use each animal once only.)



An animal that has a hard outside skeleton is

\_\_\_\_\_

An animal without a backbone that has many segments to its body is

\_\_\_\_\_

An animal that has hair and an inside skeleton is

\_\_\_\_\_

An animal that has a scaly skin and an inside skeleton is

\_\_\_\_\_

## Overall Percent Correct

|                |    |   |
|----------------|----|---|
| Hong Kong      | 94 | ▲ |
| Korea          | 85 | ▲ |
| Japan          | 83 | ▲ |
| Australia      | 79 | ▲ |
| United States  | 78 | ▲ |
| Singapore      | 76 | ▲ |
| Hungary        | 74 | ▲ |
| England        | 72 | ▲ |
| Austria        | 71 | ▲ |
| Czech Republic | 71 | ▲ |
| Scotland       | 71 | ▲ |
| Canada         | 69 | ▲ |
| New Zealand    | 67 | ○ |
| Slovenia       | 67 | ○ |
| Greece         | 63 | ○ |

## International average 62

|                    |    |   |
|--------------------|----|---|
| Cyprus             | 62 | ○ |
| Ireland            | 60 | ○ |
| Netherlands        | 57 | ○ |
| Norway             | 57 | ○ |
| Latvia (LSS)       | 49 | ▼ |
| Israel             | 45 | ▼ |
| Portugal           | 41 | ▼ |
| Iceland            | 40 | ▼ |
| Kuwait             | 38 | ▼ |
| Iran, Islamic Rep. | 27 | ▼ |
| Thailand           | 24 | ▼ |

## Country average vs. International average:

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

Item Number: Z2

## SCORING

## Correct Response

- Crab - Earthworm - Horse - Snake in this order.
- One or more general terms are used, in the correct order, for the above organisms. (Crustacean, Reptile, etc.)

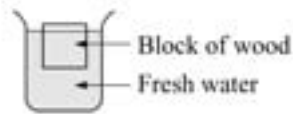
## Incorrect Response

- No correct answers.
- Only crab and horse are correct.
- Any other two or three are correct.
- Only crab is correct.
- Only horse is correct.
- Only earthworm is correct.
- Only snake is correct.
- Other incorrect.

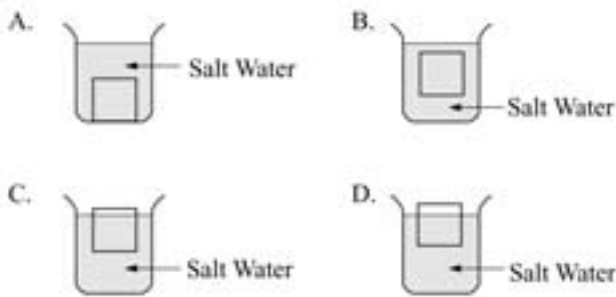
|                         |                                   |
|-------------------------|-----------------------------------|
| <b>Content Domain</b>   | <b>Cognitive Domain</b>           |
| <b>Physical Science</b> | Understanding Complex Information |

Block floating in water

The picture shows a block of wood floating in fresh water.



If this block were placed in salt water from the ocean, which picture shows what would happen?



**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 54        | ▲ |
| Slovenia                     | 46        | ▲ |
| Hong Kong                    | 44        | ▲ |
| Austria                      | 43        | ○ |
| Norway                       | 41        | ○ |
| Singapore                    | 40        | ▲ |
| Israel                       | 38        | ○ |
| Cyprus                       | 37        | ○ |
| Japan                        | 37        | ○ |
| Canada                       | 36        | ○ |
| Czech Republic               | 35        | ○ |
| Ireland                      | 34        | ○ |
| New Zealand                  | 34        | ○ |
| <b>International average</b> | <b>34</b> |   |
| Kuwait                       | 33        | ○ |
| Australia                    | 32        | ○ |
| Greece                       | 32        | ○ |
| Netherlands                  | 31        | ○ |
| Scotland                     | 31        | ○ |
| United States                | 31        | ○ |
| England                      | 29        | ○ |
| Iceland                      | 29        | ○ |
| Latvia (LSS)                 | 26        | ○ |
| Hungary                      | 24        | ▼ |
| Thailand                     | 24        | ▼ |
| Iran, Islamic Rep.           | 20        | ▼ |
| Portugal                     | 20        | ▼ |

**Country average vs. International average:**

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

Item Number: N4

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>D</b> |
|--------------------------|----------|

| Content Domain   | Cognitive Domain                 |
|------------------|----------------------------------|
| Physical Science | Understanding Simple Information |

## Girl's source of energy

Keisha is pushing her bicycle up a hill. Where does Keisha get the energy to push her bicycle?



- A. From the food she has eaten
- B. From the exercise she did earlier
- C. From the ground she is walking on
- D. From the bicycle she is pushing

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Iceland                      | 70        | ▲ |
| Netherlands                  | 70        | ▲ |
| Austria                      | 66        | ▲ |
| Korea                        | 65        | ▲ |
| Singapore                    | 64        | ▲ |
| Canada                       | 63        | ▲ |
| Japan                        | 63        | ▲ |
| England                      | 61        | ▲ |
| Norway                       | 61        | ○ |
| United States                | 60        | ▲ |
| Australia                    | 59        | ○ |
| Czech Republic               | 54        | ○ |
| Hong Kong                    | 54        | ○ |
| <b>International average</b> | <b>52</b> |   |
| Ireland                      | 52        | ○ |
| Israel                       | 52        | ○ |
| Scotland                     | 51        | ○ |
| New Zealand                  | 50        | ○ |
| Iran, Islamic Rep.           | 47        | ○ |
| Slovenia                     | 46        | ○ |
| Latvia (LSS)                 | 44        | ○ |
| Portugal                     | 44        | ○ |
| Hungary                      | 42        | ▼ |
| Kuwait                       | 32        | ▼ |
| Greece                       | 31        | ▼ |
| Cyprus                       | 29        | ▼ |
| Thailand                     | 25        | ▼ |

Country average vs.  
International average:

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

Item Number: N7

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



| Content Domain   | Cognitive Domain                  |
|------------------|-----------------------------------|
| Physical Science | Understanding Complex Information |

## Powder with white/black specks

A powder made up of both white specks and black specks is likely to be

A. a solution

B. a pure compound

C. a mixture

D. an element

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Netherlands                  | 85        | ▲ |
| Korea                        | 83        | ▲ |
| Ireland                      | 78        | ▲ |
| Austria                      | 77        | ▲ |
| Hungary                      | 77        | ▲ |
| Australia                    | 75        | ▲ |
| England                      | 75        | ▲ |
| Canada                       | 73        | ▲ |
| Singapore                    | 71        | ▲ |
| United States                | 71        | ▲ |
| Scotland                     | 70        | ▲ |
| New Zealand                  | 67        | ○ |
| Latvia (LSS)                 | 61        | ○ |
| Portugal                     | 61        | ○ |
| Slovenia                     | 61        | ○ |
| <b>International average</b> | <b>61</b> |   |
| Israel                       | 55        | ○ |
| Czech Republic               | 54        | ▼ |
| Cyprus                       | 53        | ○ |
| Norway                       | 52        | ○ |
| Hong Kong                    | 48        | ▼ |
| Kuwait                       | 47        | ▼ |
| Greece                       | 42        | ▼ |
| Japan                        | 42        | ▼ |
| Iran, Islamic Rep.           | 36        | ▼ |
| Iceland                      | 35        | ▼ |
| Thailand                     | 30        | ▼ |

Country average vs.  
International average:

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

Item Number: N8

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

| Content Domain   | Cognitive Domain                                       |
|------------------|--|
| Physical Science | Using Tools, Routine Procedures, and Science Processes |

Which box has least mass

Which of the boxes X, Y, or Z has the LEAST mass?

A. X

B. Y

C. Z

D. All three boxes have the same mass.

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 87        | ▲ |
| Korea                        | 81        | ▲ |
| Hong Kong                    | 80        | ▲ |
| Netherlands                  | 78        | ▲ |
| New Zealand                  | 72        | ▲ |
| Canada                       | 70        | ○ |
| Czech Republic               | 70        | ○ |
| Iceland                      | 70        | ○ |
| Norway                       | 70        | ○ |
| Singapore                    | 69        | ▲ |
| Hungary                      | 66        | ○ |
| Australia                    | 65        | ○ |
| Scotland                     | 65        | ○ |
| Thailand                     | 64        | ○ |
| <b>International average</b> | <b>63</b> |   |
| United States                | 62        | ○ |
| Ireland                      | 61        | ○ |
| Slovenia                     | 61        | ○ |
| Cyprus                       | 54        | ○ |
| England                      | 54        | ○ |
| Greece                       | 52        | ▼ |
| Latvia (LSS)                 | 52        | ○ |
| Austria                      | 49        | ▼ |
| Israel                       | 49        | ▼ |
| Portugal                     | 45        | ▼ |
| Iran, Islamic Rep.           | 42        | ▼ |
| Kuwait                       | 38        | ▼ |

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

Item Number: N9

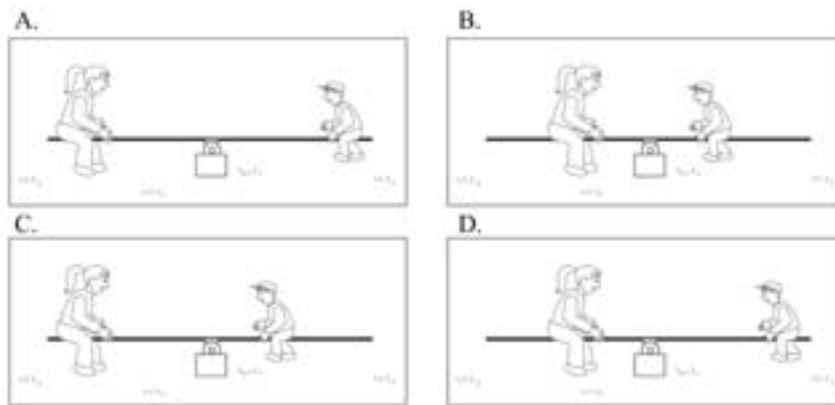
|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>A</b> |
|--------------------------|----------|

|                         |   |
|-------------------------|---|
| <b>Content Domain</b>   | <b>Cognitive Domain</b>                     |
| <b>Physical Science</b> | Theorizing, Analyzing, and Solving Problems |

Balance on seesaw

A girl wanted to play on a seesaw with her little brother.

Which picture shows the best way for the girl, who weighed 50 kg (kilograms), to balance her brother, who weighed 25 kg?



Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 84        | ▲ |
| Norway                       | 64        | ▲ |
| Japan                        | 63        | ▲ |
| Czech Republic               | 59        | ▲ |
| Austria                      | 56        | ○ |
| Slovenia                     | 54        | ○ |
| Australia                    | 53        | ○ |
| Singapore                    | 53        | ▲ |
| Canada                       | 52        | ○ |
| Netherlands                  | 51        | ○ |
| Latvia (LSS)                 | 48        | ○ |
| New Zealand                  | 48        | ○ |
| <b>International average</b> | <b>46</b> |   |
| Iceland                      | 45        | ○ |
| Hong Kong                    | 44        | ○ |
| United States                | 44        | ○ |
| Hungary                      | 40        | ○ |
| Ireland                      | 39        | ○ |
| Thailand                     | 39        | ○ |
| England                      | 38        | ○ |
| Portugal                     | 37        | ○ |
| Israel                       | 35        | ▼ |
| Scotland                     | 34        | ▼ |
| Cyprus                       | 32        | ▼ |
| Greece                       | 32        | ○ |
| Iran, Islamic Rep.           | 22        | ▼ |
| Kuwait                       | 18        | ▼ |

Country average vs. International average:

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

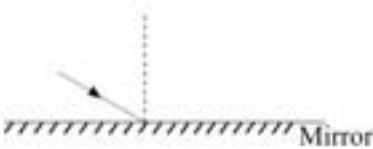
Item Number: O1

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>D</b> |
|--------------------------|----------|

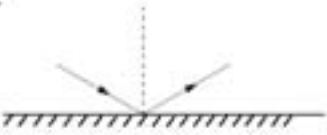
|                         |   |
|-------------------------|---|
| <b>Content Domain</b>   | <b>Cognitive Domain</b>                     |
| <b>Physical Science</b> | Theorizing, Analyzing, and Solving Problems |

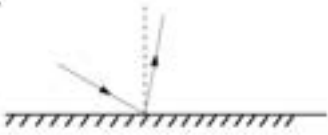
What would reflection look like

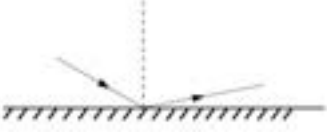
A beam of light strikes a mirror as shown.

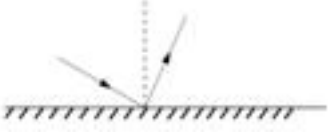


Which picture best shows what the reflected light would look like?

A. 

B. 

C. 

D. 

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 90        | ▲ |
| Canada                       | 63        | ○ |
| England                      | 63        | ○ |
| Singapore                    | 63        | ○ |
| Czech Republic               | 62        | ○ |
| Hong Kong                    | 62        | ○ |
| Hungary                      | 60        | ○ |
| Cyprus                       | 59        | ○ |
| Japan                        | 59        | ○ |
| Israel                       | 58        | ○ |
| Thailand                     | 58        | ○ |
| New Zealand                  | 57        | ○ |
| Scotland                     | 57        | ○ |
| United States                | 57        | ○ |
| <b>International average</b> | <b>56</b> |   |
| Australia                    | 56        | ○ |
| Slovenia                     | 56        | ○ |
| Ireland                      | 55        | ○ |
| Austria                      | 53        | ○ |
| Greece                       | 52        | ○ |
| Iceland                      | 51        | ○ |
| Netherlands                  | 51        | ○ |
| Portugal                     | 50        | ○ |
| Norway                       | 46        | ○ |
| Iran, Islamic Rep.           | 44        | ▼ |
| Latvia (LSS)                 | 44        | ▼ |
| Kuwait                       | 42        | ▼ |

|   |   |
|---|---|
| <b>Country average vs. International average:</b> |   |
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

Item Number: O5

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>A</b> |
|--------------------------|----------|

| Content Domain   | Cognitive Domain                  |
|------------------|-----------------------------------|
| Physical Science | Understanding Complex Information |

Mixture of iron and sand

In a box there is a mixture of iron filings and sand. Which is the easiest way to separate the iron filings from the sand?

A. Pour water on the mixture

B. Use a magnifying glass

C. Use a magnet

D. Heat the mixture

Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 96        | ▲ |
| Japan                        | 89        | ▲ |
| Iran, Islamic Rep.           | 73        | ▲ |
| Singapore                    | 67        | ▲ |
| Israel                       | 64        | ○ |
| Latvia (LSS)                 | 60        | ○ |
| Czech Republic               | 59        | ○ |
| Hungary                      | 59        | ○ |
| Netherlands                  | 59        | ○ |
| Norway                       | 59        | ○ |
| Austria                      | 56        | ○ |
| <b>International average</b> | <b>55</b> |   |
| Australia                    | 54        | ○ |
| England                      | 53        | ○ |
| United States                | 53        | ○ |
| Portugal                     | 52        | ○ |
| Greece                       | 50        | ○ |
| Scotland                     | 49        | ○ |
| Hong Kong                    | 48        | ○ |
| Slovenia                     | 47        | ○ |
| New Zealand                  | 46        | ○ |
| Thailand                     | 45        | ▼ |
| Canada                       | 43        | ▼ |
| Cyprus                       | 43        | ▼ |
| Ireland                      | 42        | ▼ |
| Iceland                      | 41        | ▼ |
| Kuwait                       | 35        | ▼ |

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

Item Number: O8

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

| Content Domain   | Cognitive Domain                 |
|------------------|----------------------------------|
| Physical Science | Understanding Simple Information |

What is not energy source

Which is NOT used as an energy source?

A. Flowing water

B. Iron ore

C. Sun

D. Oil

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Austria                      | 47        | ▲ |
| Japan                        | 46        | ▲ |
| Ireland                      | 40        | ○ |
| Scotland                     | 40        | ○ |
| Slovenia                     | 40        | ○ |
| Canada                       | 39        | ○ |
| Hungary                      | 38        | ○ |
| Netherlands                  | 38        | ○ |
| United States                | 38        | ○ |
| Iceland                      | 37        | ○ |
| England                      | 36        | ○ |
| Israel                       | 36        | ○ |
| <b>International average</b> | <b>35</b> |   |
| Greece                       | 34        | ○ |
| Hong Kong                    | 34        | ○ |
| Portugal                     | 34        | ○ |
| Australia                    | 33        | ○ |
| Cyprus                       | 32        | ○ |
| Iran, Islamic Rep.           | 32        | ○ |
| New Zealand                  | 32        | ○ |
| Norway                       | 32        | ○ |
| Czech Republic               | 31        | ○ |
| Korea                        | 31        | ○ |
| Kuwait                       | 27        | ○ |
| Latvia (LSS)                 | 27        | ○ |
| Thailand                     | 27        | ○ |
| Singapore                    | 20        | ▼ |

### Country average vs. International average:

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

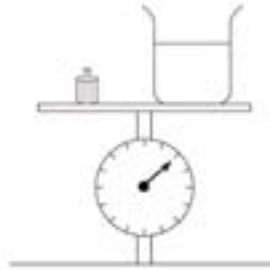
Item Number: P3

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

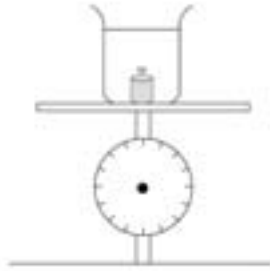
| Content Domain   | Cognitive Domain                            |
|------------------|---|
| Physical Science | Theorizing, Analyzing, and Solving Problems |

### Beaker on scale

Elizabeth put a weight and a beaker of water on a scale, as shown in the first picture.



Then she moved the beaker and put the weight in it, as shown in the second picture.



What will the scale show now? Draw an arrow on the second picture to show your answer.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 58        | ▲ |
| Korea                        | 48        | ▲ |
| Slovenia                     | 48        | ▲ |
| Singapore                    | 47        | ▲ |
| Latvia (LSS)                 | 45        | ▲ |
| Czech Republic               | 43        | ▲ |
| Austria                      | 40        | ○ |
| Hungary                      | 39        | ○ |
| Australia                    | 38        | ○ |
| Netherlands                  | 37        | ○ |
| Iceland                      | 36        | ○ |
| <b>International average</b> | <b>34</b> |   |
| Hong Kong                    | 33        | ○ |
| Greece                       | 32        | ○ |
| New Zealand                  | 32        | ○ |
| Israel                       | 31        | ○ |
| Ireland                      | 30        | ○ |
| Portugal                     | 30        | ○ |
| Scotland                     | 30        | ○ |
| Canada                       | 28        | ○ |
| Cyprus                       | 28        | ○ |
| Norway                       | 28        | ○ |
| England                      | 27        | ○ |
| Iran, Islamic Rep.           | 27        | ○ |
| Thailand                     | 22        | ▼ |
| United States                | 21        | ▼ |
| Kuwait                       | 10        | ▼ |

### Country average vs. International average:

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

Item Number: P4

## SCORING

### Correct Response

- The arrow or line is in the same position as in the first diagram or is described in words. Allow about 0.5 mm tolerance on each side.

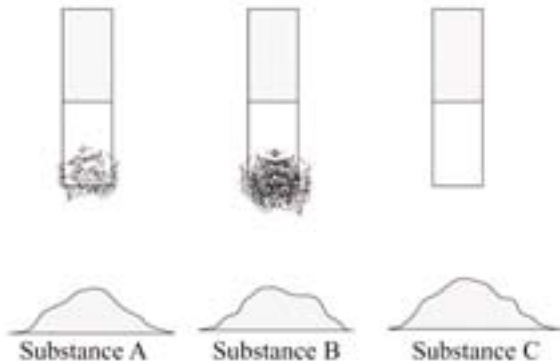
### Incorrect Response

- The arrow is pointing to a greater weight, that is the arrow is pointing downward somewhere between its original position and vertically down.  
OR the student states that it "Weighs more" or similar expression.
- The arrow is pointing to a lesser weight than in the original picture, that is the arrow is pointing upward, between the original position and vertically up.  
OR the student states that it "Weighs less" or similar expression.
- Other incorrect.

|                         |  |
|-------------------------|--|
| <b>Content Domain</b>   | <b>Cognitive Domain</b>                  |
| <b>Physical Science</b> | <b>Understanding Complex Information</b> |

Magnet and coffee

Each of the three magnets shown has been dipped into the substance below it. Which of the substances could be coffee?



- A. A only
- B. B only
- C. C only
- D. A and B only

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 84        | ▲ |
| Japan                        | 83        | ▲ |
| Singapore                    | 70        | ▲ |
| Czech Republic               | 66        | ▲ |
| Hungary                      | 64        | ▲ |
| England                      | 59        | ▲ |
| Hong Kong                    | 59        | ▲ |
| Scotland                     | 57        | ○ |
| Australia                    | 56        | ○ |
| Netherlands                  | 53        | ○ |
| United States                | 53        | ○ |
| New Zealand                  | 52        | ○ |
| Slovenia                     | 52        | ○ |
| Austria                      | 51        | ○ |
| Canada                       | 51        | ○ |
| Ireland                      | 50        | ○ |
| <b>International average</b> | <b>50</b> |   |
| Cyprus                       | 42        | ○ |
| Norway                       | 40        | ▼ |
| Israel                       | 38        | ▼ |
| Latvia (LSS)                 | 38        | ▼ |
| Portugal                     | 34        | ▼ |
| Iceland                      | 33        | ▼ |
| Iran, Islamic Rep.           | 32        | ▼ |
| Thailand                     | 29        | ▼ |
| Greece                       | 25        | ▼ |
| Kuwait                       | 25        | ▼ |

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: P5

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>C</b> |
|--------------------------|----------|



| Content Domain   | Cognitive Domain                  |
|------------------|-----------------------------------|
| Physical Science | Understanding Complex Information |

What travels fastest

Which travels fastest?

A. A train

B. An airplane

C. Sound

D. Light

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 64        | ▲ |
| Australia                    | 59        | ▲ |
| Japan                        | 58        | ▲ |
| New Zealand                  | 56        | ▲ |
| Czech Republic               | 53        | ▲ |
| England                      | 50        | ▲ |
| Slovenia                     | 50        | ○ |
| Hungary                      | 49        | ○ |
| Norway                       | 48        | ○ |
| Canada                       | 44        | ○ |
| Hong Kong                    | 44        | ○ |
| Austria                      | 43        | ○ |
| Israel                       | 43        | ○ |
| United States                | 43        | ○ |
| <b>International average</b> | <b>41</b> |   |
| Latvia (LSS)                 | 41        | ○ |
| Ireland                      | 39        | ○ |
| Singapore                    | 38        | ○ |
| Iceland                      | 37        | ○ |
| Iran, Islamic Rep.           | 34        | ○ |
| Scotland                     | 34        | ○ |
| Portugal                     | 33        | ▼ |
| Greece                       | 29        | ▼ |
| Netherlands                  | 27        | ▼ |
| Cyprus                       | 23        | ▼ |
| Thailand                     | 22        | ▼ |
| Kuwait                       | 16        | ▼ |

### Country average vs. International average:

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

Item Number: P7

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

| Content Domain   | Cognitive Domain                  |
|------------------|-----------------------------------|
| Physical Science | Understanding Complex Information |

Which doesn't change in wet ground

Some things were buried in wet ground. Several years later they were dug up. Which thing is MOST likely to have stayed the same?

- A. An egg shell
- B. A plastic cup
- C. A paper plate
- D. An orange peel

#### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Hungary                      | 76        | ▲ |
| Japan                        | 76        | ▲ |
| Korea                        | 74        | ▲ |
| Slovenia                     | 67        | ▲ |
| Austria                      | 66        | ▲ |
| Australia                    | 63        | ▲ |
| Latvia (LSS)                 | 62        | ○ |
| Canada                       | 60        | ○ |
| Czech Republic               | 60        | ○ |
| England                      | 60        | ○ |
| Netherlands                  | 59        | ○ |
| Thailand                     | 57        | ○ |
| New Zealand                  | 54        | ○ |
| <b>International average</b> | <b>54</b> |   |
| Scotland                     | 51        | ○ |
| United States                | 51        | ○ |
| Greece                       | 50        | ○ |
| Norway                       | 50        | ○ |
| Israel                       | 49        | ○ |
| Cyprus                       | 48        | ○ |
| Ireland                      | 41        | ▼ |
| Hong Kong                    | 40        | ▼ |
| Singapore                    | 40        | ▼ |
| Iceland                      | 39        | ▼ |
| Portugal                     | 38        | ▼ |
| Iran, Islamic Rep.           | 37        | ▼ |
| Kuwait                       | 29        | ▼ |

#### Country average vs. International average:

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

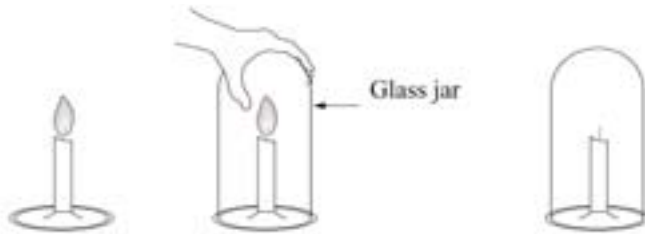
Item Number: Q3

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

| Content Domain   | Cognitive Domain                            |
|------------------|---|
| Physical Science | Theorizing, Analyzing, and Solving Problems |

## Glass over candle

When a glass jar is placed over a lighted candle, the flame goes out.



Why does this happen?

## Overall Percent Correct

|                |    |   |
|----------------|----|---|
| Slovenia       | 94 | ▲ |
| Czech Republic | 85 | ▲ |
| Austria        | 83 | ▲ |
| Singapore      | 78 | ▲ |
| Hungary        | 77 | ▲ |
| Norway         | 75 | ▲ |
| Korea          | 74 | ▲ |
| Netherlands    | 74 | ▲ |
| Australia      | 69 | ○ |
| Hong Kong      | 68 | ○ |
| England        | 66 | ○ |
| New Zealand    | 66 | ○ |
| Scotland       | 66 | ○ |

## International average 64

|                    |    |   |
|--------------------|----|---|
| Portugal           | 63 | ○ |
| Iceland            | 62 | ○ |
| Ireland            | 62 | ○ |
| Latvia (LSS)       | 62 | ○ |
| United States      | 62 | ○ |
| Canada             | 61 | ○ |
| Israel             | 60 | ○ |
| Cyprus             | 56 | ○ |
| Greece             | 50 | ▼ |
| Japan              | 48 | ▼ |
| Kuwait             | 39 | ▼ |
| Thailand           | 37 | ▼ |
| Iran, Islamic Rep. | 33 | ▼ |

Item Number: Q4

## SCORING

## Correct Response

- Refers to the need for oxygen.  
Examples: *Fire does not get enough oxygen.*  
*The oxygen will be used up.*
- Refers to the need for air.  
Example: *Fire does not get enough air.*
- Refers to the need for air, using non-scientific language.  
Examples: *The fire will be "strangulated."*  
*The fire cannot breathe.*
- Other acceptable.

## Incorrect Response

- Refers to its getting too hot.
- States that the gas (smoke, vapor, carbon dioxide...) is trapped inside the jar.  
Example: *The smoke cannot come out.*
- Refers to the properties of the glass.  
Example: *The glass makes it cold.*
- Repeats the information in the stem.  
Example: *The glass is placed over it.*
- Other incorrect:  
Example: *You put it on too fast and the wind makes it go out.*

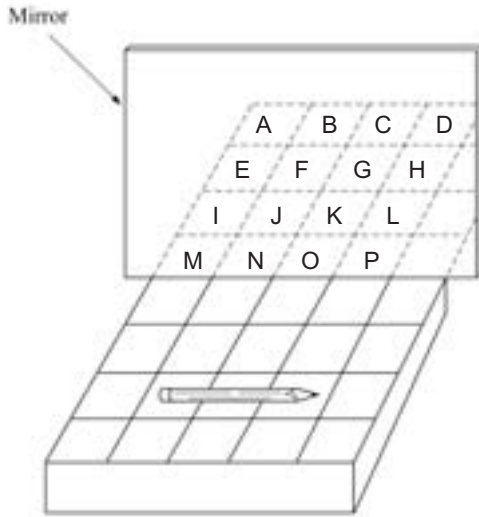
## Country average vs. International average:

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

| Content Domain   | Cognitive Domain                                       |
|------------------|--|
| Physical Science | Using Tools, Routine Procedures, and Science Processes |

Pencil in the mirror

The picture shows a pencil that is lying on a shelf in front of a mirror. Draw a picture of the pencil as you would see it in the mirror. Use the patterns of lines on the shelf to help you.



Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Singapore                    | 66        | ▲ |
| Netherlands                  | 64        | ▲ |
| Japan                        | 62        | ▲ |
| England                      | 61        | ▲ |
| Hong Kong                    | 60        | ▲ |
| Korea                        | 59        | ▲ |
| Hungary                      | 58        | ▲ |
| Scotland                     | 58        | ▲ |
| Australia                    | 56        | ▲ |
| Czech Republic               | 56        | ○ |
| Slovenia                     | 55        | ○ |
| Austria                      | 53        | ○ |
| Canada                       | 53        | ○ |
| Iceland                      | 50        | ○ |
| <b>International average</b> | <b>47</b> |   |
| Latvia (LSS)                 | 47        | ○ |
| New Zealand                  | 44        | ○ |
| United States                | 43        | ○ |
| Norway                       | 42        | ○ |
| Ireland                      | 38        | ▼ |
| Thailand                     | 38        | ○ |
| Israel                       | 37        | ▼ |
| Portugal                     | 37        | ▼ |
| Greece                       | 29        | ▼ |
| Cyprus                       | 24        | ▼ |
| Kuwait                       | 20        | ▼ |
| Iran, Islamic Rep.           | 17        | ▼ |

Country average vs. International average:

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

Item Number: Q8

SCORING

Note: In the scoring guide below, the letters refer to squares which are covered by the image of the pencil. Pencil on the borderline should be accepted as correct.

Correct Response

- FGH; pencil point to the right.
- FGH; point not shown.
- FG or GH (point to the right either shown or not shown) OR any other in the row E,F,G,H as long as the point is not clearly turned to the left.

Incorrect Response

- FGH, FG or GH, pencil point clearly turned to the left OR other in the row E,F,G,H.
- Lists all or some part of the row: ABCD.
- Lists all or some part of JKL; pencil point to the right may or may not be shown.
- Lists all or some of the row MNOP, point to the right may or may not be shown.
- Other incorrect.

| Content Domain   | Cognitive Domain                                       |
|------------------|--|
| Physical Science | Using Tools, Routine Procedures, and Science Processes |

Why does liquid in thermometer rise

Ken put a thermometer in a glass filled with hot water. Why does the liquid inside the thermometer rise?

A. Gravity pushes it up.

B. Air bubbles are released.

C. Heat from the water makes it expand.

D. Air pressure above the water pulls it up.

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Hong Kong                    | 74        | ▲ |
| Australia                    | 72        | ▲ |
| England                      | 72        | ▲ |
| Singapore                    | 70        | ▲ |
| United States                | 69        | ▲ |
| Canada                       | 66        | ▲ |
| Austria                      | 65        | ○ |
| Netherlands                  | 63        | ○ |
| Japan                        | 60        | ○ |
| Scotland                     | 60        | ○ |
| Ireland                      | 59        | ○ |
| New Zealand                  | 59        | ○ |
| Czech Republic               | 58        | ○ |
| <b>International average</b> | <b>56</b> |   |
| Greece                       | 56        | ○ |
| Norway                       | 56        | ○ |
| Korea                        | 54        | ○ |
| Hungary                      | 49        | ○ |
| Kuwait                       | 49        | ○ |
| Cyprus                       | 48        | ○ |
| Iceland                      | 48        | ○ |
| Israel                       | 47        | ○ |
| Thailand                     | 47        | ○ |
| Latvia (LSS)                 | 43        | ▼ |
| Portugal                     | 42        | ▼ |
| Slovenia                     | 40        | ▼ |
| Iran, Islamic Rep.           | 34        | ▼ |

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


Item Number: Q9

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

|                         |  |
|-------------------------|--|
| <b>Content Domain</b>   | <b>Cognitive Domain</b>                  |
| <b>Physical Science</b> | <b>Understanding Complex Information</b> |


**Tipped watering can**

A watering can is almost filled with water as shown.



The watering can is tipped so that the water just begins to drip through the spout.

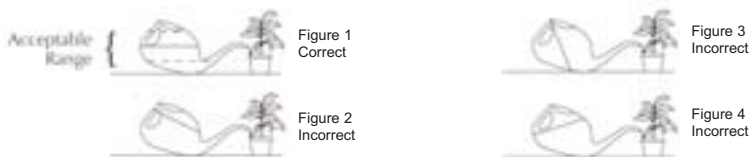
Draw a line to show where the surface of the water in the can is now.



| <b>Overall Percent Correct</b> |           |   |
|--------------------------------|-----------|---|
| Singapore                      | 32        | ▲ |
| Latvia (LSS)                   | 30        | ○ |
| England                        | 29        | ▲ |
| Czech Republic                 | 28        | ○ |
| Hong Kong                      | 28        | ○ |
| Netherlands                    | 28        | ○ |
| Japan                          | 27        | ○ |
| Hungary                        | 26        | ○ |
| Korea                          | 26        | ○ |
| Austria                        | 25        | ○ |
| Slovenia                       | 25        | ○ |
| Canada                         | 22        | ○ |
| <b>International average</b>   | <b>21</b> |   |
| Norway                         | 21        | ○ |
| United States                  | 21        | ○ |
| Australia                      | 20        | ○ |
| Portugal                       | 20        | ○ |
| Ireland                        | 19        | ○ |
| Greece                         | 17        | ○ |
| Iceland                        | 17        | ○ |
| New Zealand                    | 17        | ○ |
| Scotland                       | 15        | ▼ |
| Thailand                       | 15        | ○ |
| Cyprus                         | 13        | ▼ |
| Israel                         | 13        | ▼ |
| Iran, Islamic Rep.             | 10        | ▼ |
| Kuwait                         | 8         | ▼ |

Item Number: R1

**SCORING**



Note: For wrong answers, the focus is on the angle of the water surface. The exact level (amount of water) is not important. See illustration above.

**Correct Response**

- Approximately\* horizontal level of water within allowable range (see Figure 1).

**Incorrect Response**

- Approximately\* horizontal level of water. Higher or lower level of water than allowable range.
- Water level is approximately\* parallel to the bottom of the can (see Figure 2).
- Water level clearly steeper than the bottom of the can (see Figure 3).
- Water level is inclined in the opposite direction of the bottom of the can (see Figure 4).
- Other incorrect:  
*Examples: Water in the spout only.*  
*Water only in the flower pot.*

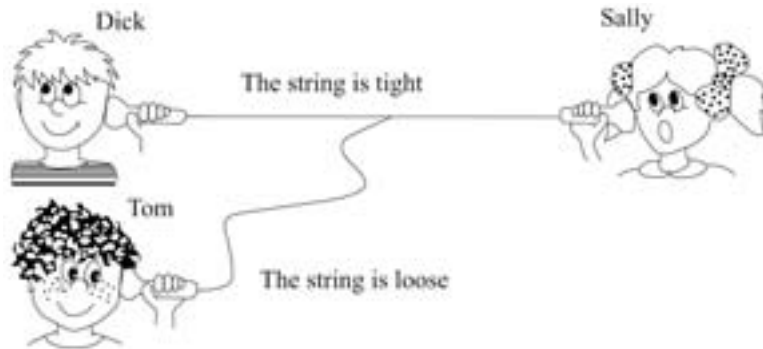
| <b>Country average vs. International average:</b> |   |
|---|---|
| Higher  | ▲ |
| Not different                                     | ○ |
| Lower   | ▼ |

\*By "approximately" it is meant within 10 degrees. 

| Content Domain   | Cognitive Domain                  |
|------------------|-----------------------------------|
| Physical Science | Understanding Complex Information |

## Sound through string

The picture shows Dick and his friends playing with a string-telephone. Sally is speaking. Dick and Tom are trying to listen. Which of them can hear her speak?



- A. Both of them can hear equally clearly.
- B. Neither of them can hear.
- C. Only Tom can hear clearly.
- D. Only Dick can hear clearly.
- E. Both of them hear equally faintly.

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 86        | ▲ |
| Korea                        | 82        | ▲ |
| Singapore                    | 80        | ▲ |
| United States                | 72        | ▲ |
| Netherlands                  | 71        | ▲ |
| Canada                       | 70        | ▲ |
| England                      | 69        | ▲ |
| Cyprus                       | 67        | ▲ |
| Ireland                      | 66        | ○ |
| Hong Kong                    | 65        | ○ |
| Israel                       | 64        | ○ |
| Thailand                     | 64        | ○ |
| Austria                      | 62        | ○ |
| Scotland                     | 61        | ○ |
| Australia                    | 60        | ○ |
| Portugal                     | 60        | ○ |
| <b>International average</b> | <b>59</b> |   |
| Greece                       | 55        | ○ |
| Norway                       | 55        | ○ |
| Slovenia                     | 52        | ○ |
| Czech Republic               | 51        | ○ |
| New Zealand                  | 47        | ▼ |
| Iceland                      | 44        | ▼ |
| Latvia (LSS)                 | 34        | ▼ |
| Kuwait                       | 32        | ▼ |
| Hungary                      | 29        | ▼ |
| Iran, Islamic Rep.           | 25        | ▼ |

## Country average vs. International average:

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

Item Number: R5

Correct Response:

D

| Content Domain   | Cognitive Domain                 |
|------------------|----------------------------------|
| Physical Science | Understanding Simple Information |

Which produces light

Which makes its own light?

A. A mirror

B. A candle flame

C. A diamond ring

D. A magnifying lens

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Austria                      | 83        | ▲ |
| Hungary                      | 72        | ▲ |
| Czech Republic               | 69        | ▲ |
| Netherlands                  | 67        | ▲ |
| Israel                       | 63        | ▲ |
| Cyprus                       | 57        | ○ |
| Portugal                     | 57        | ○ |
| Canada                       | 56        | ○ |
| Iceland                      | 56        | ○ |
| Slovenia                     | 56        | ○ |
| United States                | 55        | ○ |
| Greece                       | 54        | ○ |
| Latvia (LSS)                 | 53        | ○ |
| <b>International average</b> | <b>52</b> |   |
| Australia                    | 52        | ○ |
| England                      | 50        | ○ |
| New Zealand                  | 48        | ○ |
| Singapore                    | 48        | ○ |
| Ireland                      | 47        | ○ |
| Scotland                     | 47        | ○ |
| Hong Kong                    | 45        | ▼ |
| Iran, Islamic Rep.           | 39        | ▼ |
| Norway                       | 39        | ▼ |
| Kuwait                       | 37        | ▼ |
| Japan                        | 31        | ▼ |
| Thailand                     | 25        | ▼ |

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

Item Number: R8

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|



| Content Domain   | Cognitive Domain                 |
|------------------|----------------------------------|
| Physical Science | Understanding Simple Information |

### Advantage of solar energy

One advantage of solar energy is that it

A. does not pollute

B. is not renewable

C. is efficient in any climate

D. is available at all times

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Japan                        | 80        | ▲ |
| Austria                      | 62        | ▲ |
| Australia                    | 57        | ▲ |
| Israel                       | 55        | ▲ |
| Slovenia                     | 55        | ▲ |
| Canada                       | 53        | ○ |
| Czech Republic               | 52        | ○ |
| Hong Kong                    | 52        | ○ |
| Iceland                      | 51        | ○ |
| Korea                        | 48        | ○ |
| Ireland                      | 47        | ○ |
| United States                | 47        | ○ |
| New Zealand                  | 44        | ○ |
| <b>International average</b> | <b>44</b> |   |
| Hungary                      | 43        | ○ |
| Portugal                     | 42        | ○ |
| England                      | 38        | ○ |
| Netherlands                  | 38        | ○ |
| Scotland                     | 38        | ○ |
| Latvia (LSS)                 | 36        | ○ |
| Singapore                    | 36        | ▼ |
| Norway                       | 34        | ○ |
| Greece                       | 33        | ▼ |
| Iran, Islamic Rep.           | 31        | ▼ |
| Cyprus                       | 27        | ▼ |
| Thailand                     | 18        | ▼ |
| Kuwait                       | 14        | ▼ |

### Country average vs. International average:

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

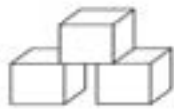
Item Number: R9

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

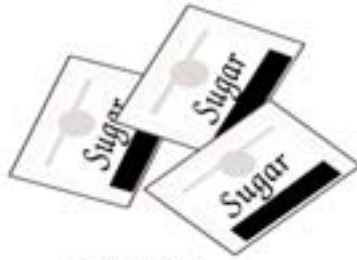
| Content Domain   | Cognitive Domain                            |
|------------------|---|
| Physical Science | Theorizing, Analyzing, and Solving Problems |

### Dissolve sugar

The picture shows two forms of sugar — solid cubes and packets of loose crystals. One cube has the same mass of sugar as one packet.



Sugar Cubes



Loose Sugar

Which of the two forms of sugar will dissolve faster in water? \_\_\_\_\_

Give a reason for your answer.

Item Number: W1

### SCORING

#### Correct Response

- Loose sugar: explanation refers to size.  
Examples: *Because it is already in smaller pieces.*  
*Because it is smaller/thinner.*  
*Because it has thousands of individual crystals.*
- Loose sugar: explanation refers to compactness of particles.  
Examples: *Because cubes are kept together.*  
*Because cubes are harder.*
- Loose sugar. Other acceptable explanations.

#### Partially Correct

- Loose sugar. No explanation.
- Loose sugar. Explanation is inadequate.  
Examples: *Loose sugar is already loose and ready to dissolve.*  
*Loose sugar isn't in cubes.*  
*The cubes will take longer to dissolve.*
- Other partially correct.

#### Incorrect Response

- Cubes. No explanation.
- Cubes. Response indicates that loose sugar is already dissolved.  
Examples: *Because only cubes need to dissolve.*  
*Because a sugar cube is not already loose.*
- Cubes. Refers to packaging.  
Example: *Because the cubes are not in a package.*
- Cubes. Other explanations.  
Example: *Because the cubes are thicker.*
- Other incorrect.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 75        | ▲ |
| Japan                        | 72        | ▲ |
| Netherlands                  | 70        | ▲ |
| Austria                      | 47        | ▲ |
| Canada                       | 46        | ▲ |
| Singapore                    | 45        | ▲ |
| Czech Republic               | 44        | ▲ |
| Ireland                      | 43        | ○ |
| United States                | 43        | ▲ |
| Australia                    | 42        | ○ |
| England                      | 42        | ○ |
| Hong Kong                    | 40        | ○ |
| Scotland                     | 40        | ○ |
| New Zealand                  | 37        | ○ |
| <b>International average</b> | <b>37</b> |   |
| Latvia (LSS)                 | 33        | ○ |
| Israel                       | 32        | ○ |
| Slovenia                     | 32        | ○ |
| Thailand                     | 30        | ○ |
| Hungary                      | 29        | ▼ |
| Cyprus                       | 27        | ▼ |
| Portugal                     | 22        | ▼ |
| Greece                       | 20        | ▼ |
| Norway                       | 18        | ▼ |
| Kuwait                       | 16        | ▼ |
| Iceland                      | 8         | ▼ |
| Iran, Islamic Rep.           | 5         | ▼ |

#### Country average vs. International average:

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

| Content Domain   | Cognitive Domain                            |
|------------------|---|
| Physical Science | Theorizing, Analyzing, and Solving Problems |

### Two bowls of soup

Anna and Uri had identical bowls of soup, both at the same temperature. Anna put a cover on her bowl.



Anna's soup



Uri's soup

Whose soup do you think would stay hot longer?

\_\_\_\_\_

Give a reason for your answer.

### Overall Percent Correct

|               |    |   |
|---------------|----|---|
| Korea         | 80 | ▲ |
| Australia     | 67 | ▲ |
| United States | 67 | ▲ |
| Netherlands   | 61 | ▲ |
| Canada        | 60 | ▲ |
| Singapore     | 60 | ▲ |
| England       | 59 | ▲ |
| Ireland       | 57 | ▲ |
| Israel        | 56 | ○ |
| New Zealand   | 56 | ▲ |
| Japan         | 55 | ▲ |
| Scotland      | 49 | ○ |

#### International average 46

|                    |    |   |
|--------------------|----|---|
| Slovenia           | 45 | ○ |
| Austria            | 44 | ○ |
| Norway             | 44 | ○ |
| Cyprus             | 39 | ▼ |
| Czech Republic     | 39 | ▼ |
| Hungary            | 39 | ▼ |
| Greece             | 36 | ▼ |
| Hong Kong          | 33 | ▼ |
| Latvia (LSS)       | 28 | ▼ |
| Iran, Islamic Rep. | 25 | ▼ |
| Portugal           | 25 | ▼ |
| Iceland            | 22 | ▼ |
| Kuwait             | 16 | ▼ |

#### Country average vs. International average:

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

Item Number: X1

## SCORING

### Correct Response

- Anna's soup. Mentions that heat or hot air does not escape Anna's soup or cold air does not enter it OR that heat (vapor, steam, smoke, etc.) disappears from Uri's soup or cold air enters it (or some combination).
- Anna's soup. Other correct explanations.

### Partially Correct

- Anna's soup. Explanation refers to the cover.  
*Example: The soup with the cover.*
- Anna's soup. Incomplete or incorrect explanation.
- Anna's soup. No explanation.
- Other partially correct.

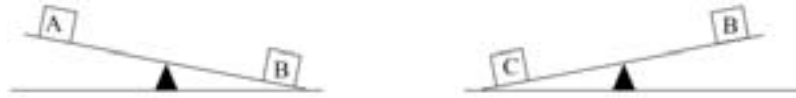
### Incorrect Response

- Uri's soup. Explanation is inadequate.
- Uri's soup. No explanation.
- Other incorrect.

| Content Domain   | Cognitive Domain                            |
|------------------|---|
| Physical Science | Theorizing, Analyzing, and Solving Problems |

## Weights of three blocks

The weights of three blocks were compared.



Which one of the three blocks weighs the most?  
(A, B, or C): \_\_\_\_\_

Explain your answer.

Item Number: Z3

## SCORING

### Correct Response

- C. Because B is heavier than A and C is heavier than B, or any equivalent expression.

### Partially Correct

- C. Explanation is inadequate.  
*Examples: Because B is higher up.*  
*C. Because it can be seen from the figure(s).*  
*C. Because it could lift up B.*
- C. No explanation.
- The wrong block is chosen but the explanation is correct.
- Other partially correct.

### Incorrect Response

- B. With or without explanation.
- A. With or without explanation.
- B and C. (Based on each of the two figures considered separately.)
- All the blocks weigh the same.
- Other incorrect.

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 74        | ▲ |
| Japan                        | 70        | ▲ |
| Hong Kong                    | 61        | ▲ |
| Singapore                    | 57        | ▲ |
| Australia                    | 47        | ▲ |
| Netherlands                  | 47        | ▲ |
| Scotland                     | 44        | ▲ |
| United States                | 42        | ▲ |
| Ireland                      | 39        | ○ |
| Canada                       | 37        | ○ |
| Iceland                      | 37        | ○ |
| <b>International average</b> | <b>37</b> |   |
| England                      | 36        | ○ |
| Norway                       | 36        | ○ |
| Slovenia                     | 36        | ○ |
| New Zealand                  | 35        | ○ |
| Czech Republic               | 34        | ○ |
| Austria                      | 32        | ○ |
| Hungary                      | 31        | ○ |
| Greece                       | 28        | ▼ |
| Israel                       | 28        | ▼ |
| Cyprus                       | 26        | ▼ |
| Latvia (LSS)                 | 25        | ▼ |
| Portugal                     | 20        | ▼ |
| Thailand                     | 16        | ▼ |
| Kuwait                       | 11        | ▼ |
| Iran, Islamic Rep.           | 4         | ▼ |

### Country average vs. International average:

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

| Content Domain                                 | Cognitive Domain                  |
|--|-----------------------------------|
| Environmental Issues and the Nature of Science | Understanding Complex Information |

### How computers help

Write down one example of how computers help people do their work.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| United States                | 81        | ▲ |
| Korea                        | 79        | ▲ |
| Australia                    | 78        | ▲ |
| Ireland                      | 77        | ▲ |
| Slovenia                     | 76        | ▲ |
| England                      | 74        | ▲ |
| Singapore                    | 74        | ▲ |
| Israel                       | 72        | ▲ |
| New Zealand                  | 72        | ▲ |
| Canada                       | 71        | ▲ |
| Netherlands                  | 71        | ▲ |
| Scotland                     | 71        | ▲ |
| Norway                       | 68        | ○ |
| Czech Republic               | 67        | ○ |
| Hong Kong                    | 65        | ○ |
| Hungary                      | 62        | ○ |
| Iceland                      | 61        | ○ |
| <b>International average</b> | <b>60</b> |   |
| Austria                      | 60        | ○ |
| Japan                        | 48        | ▼ |
| Thailand                     | 47        | ▼ |
| Greece                       | 38        | ▼ |
| Portugal                     | 35        | ▼ |
| Latvia (LSS)                 | 33        | ▼ |
| Cyprus                       | 32        | ▼ |
| Iran, Islamic Rep.           | 27        | ▼ |
| Kuwait                       | 27        | ▼ |

### Country average vs. International average:

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

Item Number: O6

## SCORING

### Correct Response

- Refers to writing OR editing text.  
*Example: With a computer you can write faster and neater.*
- Refers to doing calculations OR doing them faster.
- Refers to computer storing or retrieving information (promptly).  
*Example: It helps keep files.*
- Refers to using computers for instruction.  
*Examples: They teach you math.*  
*Computers help people understand things like math, science, or any subject at all.*
- Refers to any combination of two or more responses like those listed above.
- Other Correct:  
*Examples: The computer does no mistakes.*  
*It works faster.*

### Incorrect Response

- Playing games such as Nintendo.
- Vague references to "everything" or some similar expression.
- Merely repeats information in stem.
- Other incorrect.

| Content Domain                                 | Cognitive Domain                |
|--|---------------------------------|
| Environmental Issues and the Nature of Science | Investigating the Natural World |

## Growing seeds in light or dark

To find out whether seeds grow better in the light or dark, you could put some seeds on pieces of damp paper and

- A. keep them in a warm, dark place
- B. keep one group in a light place and another in a dark place
- C. keep them in a warm, light place
- D. put them in a light or dark place that is cool

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 66        | ▲ |
| Singapore                    | 62        | ▲ |
| United States                | 61        | ▲ |
| Australia                    | 49        | ▲ |
| Canada                       | 43        | ○ |
| England                      | 43        | ○ |
| Czech Republic               | 40        | ○ |
| Iceland                      | 40        | ○ |
| Thailand                     | 40        | ○ |
| New Zealand                  | 39        | ○ |
| <b>International average</b> | <b>36</b> |   |
| Hong Kong                    | 36        | ○ |
| Netherlands                  | 36        | ○ |
| Scotland                     | 36        | ○ |
| Slovenia                     | 36        | ○ |
| Austria                      | 35        | ○ |
| Greece                       | 30        | ○ |
| Norway                       | 30        | ○ |
| Ireland                      | 29        | ○ |
| Cyprus                       | 27        | ▼ |
| Israel                       | 26        | ▼ |
| Kuwait                       | 25        | ▼ |
| Portugal                     | 25        | ▼ |
| Latvia (LSS)                 | 23        | ▼ |
| Hungary                      | 19        | ▼ |
| Iran, Islamic Rep.           | 14        | ▼ |

## Country average vs. International average:

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

Item Number: P6

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

| Content Domain                                 | Cognitive Domain                  |
|--|-----------------------------------|
| Environmental Issues and the Nature of Science | Understanding Complex Information |

## Observations of objects in bag

Four children can feel and smell an object inside a bag, but they cannot see it. Which of the following is NOT an observation about the object?

- A. "It is flat at one end and round at the other."
- B. "It smells like peppermint."
- C. "It has a bump on it."
- D. "I hope it is candy."

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 59        | ▲ |
| United States                | 58        | ▲ |
| Australia                    | 57        | ▲ |
| Japan                        | 56        | ▲ |
| Canada                       | 54        | ○ |
| Norway                       | 54        | ▲ |
| England                      | 53        | ▲ |
| Netherlands                  | 53        | ○ |
| Ireland                      | 51        | ○ |
| New Zealand                  | 50        | ○ |
| Scotland                     | 50        | ○ |
| Czech Republic               | 47        | ○ |
| Hong Kong                    | 47        | ○ |
| Hungary                      | 44        | ○ |
| Singapore                    | 44        | ○ |
| <b>International average</b> | <b>43</b> |   |
| Austria                      | 42        | ○ |
| Israel                       | 40        | ○ |
| Slovenia                     | 38        | ○ |
| Thailand                     | 37        | ○ |
| Latvia (LSS)                 | 33        | ▼ |
| Portugal                     | 32        | ▼ |
| Cyprus                       | 29        | ▼ |
| Greece                       | 28        | ▼ |
| Iceland                      | 27        | ▼ |
| Iran, Islamic Rep.           | 21        | ▼ |
| Kuwait                       | 18        | ▼ |

Country average vs.  
International average:

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

Item Number: Q7

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

| Content Domain                                 | Cognitive Domain                                       |
|--|--|
| Environmental Issues and the Nature of Science | Using Tools, Routine Procedures, and Science Processes |

Which bulb is brightest

Some children were trying to find out which of three light bulbs was brightest. Which one of these gives the best START toward finding the answer?

- A. "One bulb looks brightest to me, so I already know the answer."
- B. "All the bulbs look bright to me, so there cannot be an answer."
- C. "It would help if we had a way to measure the brightness of a light bulb."
- D. "We can take a vote and each person will vote for the bulb he or she thinks is the brightest."

### Overall Percent Correct

|                |    |   |
|----------------|----|---|
| Korea          | 61 | ▲ |
| Hong Kong      | 60 | ▲ |
| Israel         | 59 | ▲ |
| Japan          | 59 | ▲ |
| United States  | 54 | ▲ |
| Australia      | 52 | ▲ |
| Czech Republic | 51 | ○ |
| Netherlands    | 49 | ○ |
| England        | 48 | ○ |
| Iceland        | 48 | ○ |
| New Zealand    | 46 | ○ |
| Canada         | 45 | ○ |
| Ireland        | 45 | ○ |

### International average 43

|                    |    |   |
|--------------------|----|---|
| Norway             | 42 | ○ |
| Greece             | 41 | ○ |
| Cyprus             | 40 | ○ |
| Singapore          | 38 | ○ |
| Slovenia           | 37 | ○ |
| Thailand           | 37 | ○ |
| Scotland           | 36 | ○ |
| Hungary            | 35 | ▼ |
| Latvia (LSS)       | 35 | ○ |
| Kuwait             | 32 | ▼ |
| Austria            | 27 | ▼ |
| Iran, Islamic Rep. | 24 | ▼ |
| Portugal           | 24 | ▼ |

### Country average vs. International average:

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

Item Number: R2

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



| Content Domain                                 | Cognitive Domain                  |
|--|-----------------------------------|
| Environmental Issues and the Nature of Science | Understanding Complex Information |

### Reducing air pollution: one way

Write down two different things that people can do to help reduce air pollution.

Item Number: W5A

### SCORING

Note: Each of the two things must be scored separately. If the two things described are essentially the same, the second should be scored as incorrect.

Merely mentioning causes of pollution does not receive credit.

### Correct Response

- Refers to transportation and suggests a personal choice such as reduced use of airplanes, cars and motor boats or more walking, biking, public transportation, horseback riding, sailboats.....
- Suggests manufacturing changes.  
*Examples: Make cars, buses, etc. less polluting.*
- Refers to reducing use of fossil fuels: less burning of coal or oil.
- Refers to reducing industrial pollution.  
*Example: Filter industrial waste.*
- Student suggests planting or not cutting down trees/forest.
- Refers to specific individual efforts.  
*Examples: Stop smoking.  
Stop using spray cans.*
- Other correct.

### Incorrect Response

- Student's response is vague and general.  
*Examples: Stop pollution  
Do the right things  
Clean everything  
Recycle  
Don't litter*
- Other incorrect.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Slovenia                     | 69        | ▲ |
| Australia                    | 68        | ▲ |
| Korea                        | 67        | ▲ |
| Netherlands                  | 66        | ▲ |
| Austria                      | 62        | ▲ |
| United States                | 59        | ▲ |
| Japan                        | 57        | ▲ |
| Czech Republic               | 55        | ▲ |
| Latvia (LSS)                 | 54        | ○ |
| England                      | 52        | ○ |
| Hungary                      | 52        | ○ |
| Iceland                      | 50        | ○ |
| Norway                       | 50        | ○ |
| Scotland                     | 49        | ○ |
| Thailand                     | 49        | ○ |
| <b>International average</b> | <b>48</b> |   |
| Canada                       | 46        | ○ |
| Ireland                      | 46        | ○ |
| Singapore                    | 44        | ○ |
| New Zealand                  | 41        | ○ |
| Hong Kong                    | 39        | ▼ |
| Israel                       | 38        | ▼ |
| Cyprus                       | 36        | ▼ |
| Greece                       | 33        | ▼ |
| Portugal                     | 24        | ▼ |
| Iran, Islamic Rep.           | 18        | ▼ |
| Kuwait                       | 18        | ▼ |

### Country average vs. International average:

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

| Content Domain                                 | Cognitive Domain                  |
|--|-----------------------------------|
| Environmental Issues and the Nature of Science | Understanding Complex Information |

Reducing air pollution: two ways

Write down two different things that people can do to help reduce air pollution.

Item Number: W5B

**SCORING**

Note: Each of the two things must be scored separately. If the two things described are essentially the same, the second should be scored as incorrect.

Merely mentioning causes of pollution does not receive credit.

**Correct Response**

- Refers to transportation and suggests a personal choice such as reduced use of airplanes, cars and motor boats or more walking, biking, public transportation, horseback riding, sailboats.....
- Suggests manufacturing changes.  
*Examples: Make cars, buses, etc. less polluting.*
- Refers to reducing use of fossil fuels: less burning of coal or oil.
- Refers to reducing industrial pollution.  
*Example: Filter industrial waste.*
- Student suggests planting or not cutting down trees/forest.
- Refers to specific individual efforts.  
*Examples: Stop smoking.  
Stop using spray cans.*
- Other correct.

**Incorrect Response**

- Student's response is vague and general.  
*Examples: Stop pollution  
Do the right things  
Clean everything  
Recycle  
Don't litter*
- Other incorrect.

**Overall Percent Correct**

|                              |           |   |
|------------------------------|-----------|---|
| Netherlands                  | 56        | ▲ |
| Australia                    | 52        | ▲ |
| Korea                        | 49        | ▲ |
| United States                | 48        | ▲ |
| Slovenia                     | 47        | ▲ |
| Austria                      | 46        | ▲ |
| Japan                        | 44        | ▲ |
| Norway                       | 41        | ○ |
| Czech Republic               | 38        | ○ |
| Singapore                    | 37        | ○ |
| Thailand                     | 36        | ○ |
| England                      | 35        | ○ |
| Hong Kong                    | 35        | ○ |
| Scotland                     | 35        | ○ |
| <b>International average</b> | <b>34</b> |   |
| Canada                       | 33        | ○ |
| Ireland                      | 33        | ○ |
| Iceland                      | 32        | ○ |
| New Zealand                  | 31        | ○ |
| Latvia (LSS)                 | 29        | ○ |
| Israel                       | 28        | ○ |
| Cyprus                       | 25        | ▼ |
| Greece                       | 24        | ▼ |
| Hungary                      | 23        | ▼ |
| Kuwait                       | 11        | ▼ |
| Portugal                     | 10        | ▼ |
| Iran, Islamic Rep.           | 8         | ▼ |

**Country average vs. International average:**

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

| Content Domain                                 | Cognitive Domain                  |
|--|-----------------------------------|
| Environmental Issues and the Nature of Science | Understanding Complex Information |

### Oil Spills

Write as completely as possible why large oil spills in rivers and seas are harmful to the environment.

Item Number: X3

### SCORING

#### Correct Response

Includes at least one the following elements with an explanation/elaboration:

- Oil kills living things (plants, birds,...)
- Water gets polluted
- Air and/or beaches get polluted

Examples: *Because of oil in the water, the birds get oil in their feathers and then they cool down and die.*

*Large oil spills are harmful because it goes on plants and animals.*

*Animals may breathe in the odor and then plants and animals will die. Plants and animals are a big part of our wildlife. If plants die, so would we, because plants give us oxygen.*

- Includes any combination of two or more of the elements above.

Example: *Because it can kill animals and pollute rivers.*

- Combinations of other acceptable consequences.

#### Partially Correct

- Oil kills plants/birds, fishes, seals, crabs, or other organisms.

Example: *Fish get killed.*

- The water gets polluted (poisoned, covered by oil film).
- Mentions that the air gets polluted.
- Mentions that the beaches get polluted.
- Other acceptable but incomplete.

#### Incorrect Response

- Refers to the source of the oil spill such as tank ships and motor boats.

- Vaguely refers to otherwise correct elements, but without specification.

Examples: *Oil is dangerous.*  
*Pollution.*

- Mentions that oil can cause a fire.
- Other incorrect.

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Korea                        | 64        | ▲ |
| Japan                        | 53        | ▲ |
| United States                | 46        | ▲ |
| New Zealand                  | 38        | ▲ |
| Australia                    | 37        | ▲ |
| Israel                       | 36        | ▲ |
| Canada                       | 30        | ○ |
| Ireland                      | 30        | ○ |
| Austria                      | 29        | ○ |
| Portugal                     | 29        | ○ |
| England                      | 28        | ○ |
| <b>International average</b> | <b>27</b> |   |
| Hungary                      | 26        | ○ |
| Greece                       | 25        | ○ |
| Latvia (LSS)                 | 24        | ○ |
| Scotland                     | 23        | ○ |
| Czech Republic               | 22        | ○ |
| Norway                       | 21        | ○ |
| Singapore                    | 21        | ▼ |
| Slovenia                     | 21        | ▼ |
| Iceland                      | 20        | ▼ |
| Netherlands                  | 20        | ▼ |
| Cyprus                       | 18        | ▼ |
| Thailand                     | 14        | ▼ |
| Kuwait                       | 11        | ▼ |
| Hong Kong                    | 9         | ▼ |
| Iran, Islamic Rep.           | 7         | ▼ |

#### Country average vs. International average:

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

| 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

### 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        | ○ |
| Iran, Islamic Republic of    | 69        | ○ |
| Singapore                    | 67        | ○ |
| Hungary                      | 66        | ○ |
| <b>International average</b> | <b>65</b> |   |
| Lithuania                    | 64        | ○ |
| Scotland                     | 63        | ○ |
| Italy                        | 62        | ○ |
| Slovenia                     | 47        | ▼ |
| Cyprus                       | 42        | ▼ |
| Morocco                      | 29        | ▼ |
| Philippines                  | 29        | ▼ |
| Tunisia                      | 23        | ▼ |
| Moldova, Republic of         | 22        | ▼ |
| Armenia                      | 0         | ▼ |

### Country average vs. International average:

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

Item Number: S011008

Correct Response:

**D**

| 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?

| 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        | ○ |
| United States                | 72        | ▲ |
| Lithuania                    | 71        | ○ |
| England                      | 69        | ○ |
| Norway                       | 68        | ○ |
| Australia                    | 66        | ○ |
| Russian Federation           | 66        | ○ |
| <b>International average</b> | <b>66</b> |   |
| Scotland                     | 65        | ○ |
| New Zealand                  | 63        | ○ |
| Moldova, Republic of         | 61        | ○ |
| Armenia                      | 55        | ▼ |
| Iran, Islamic Republic of    | 52        | ▼ |
| Japan                        | 51        | ▼ |
| Philippines                  | 47        | ▼ |
| Morocco                      | 34        | ▼ |
| Tunisia                      | 30        | ▼ |

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

Item Number: S031061

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

| 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) A nail is left outside and it rusts.
- (B) A glass is dropped and it shatters into small pieces.
- (C) A rubber band is stretched until it breaks.
- (D) A pencil is sharpened to a point.

## 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        | ○ |
| Australia                    | 40        | ○ |
| Japan                        | 40        | ○ |
| Lithuania                    | 39        | ○ |
| Scotland                     | 39        | ○ |
| Singapore                    | 38        | ○ |
| <b>International average</b> | <b>38</b> |   |
| Netherlands                  | 37        | ○ |
| Norway                       | 37        | ○ |
| United States                | 36        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031420

Correct Response:

A

| 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

(A) clear glass and green glass.

(B) paper cups and plastic cups.

(C) iron nails and aluminum nails.

(D) sand and salt.

### 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        | ○ |
| Latvia                       | 76        | ○ |
| United States                | 76        | ○ |
| Australia                    | 75        | ○ |
| <b>International average</b> | <b>75</b> |   |
| Scotland                     | 73        | ○ |
| Hong Kong, SAR               | 72        | ○ |
| Slovenia                     | 72        | ○ |
| New Zealand                  | 70        | ▼ |
| Belgium (Flemish)            | 67        | ▼ |
| Philippines                  | 65        | ▼ |
| Norway                       | 63        | ▼ |
| Tunisia                      | 56        | ▼ |
| Morocco                      | 55        | ▼ |

### Country average vs. International average:

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

Item Number: S011006

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

| 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

## 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        | ○ |
| United States                | 76        | ○ |
| <b>International average</b> | <b>75</b> |   |
| Moldova, Republic of         | 74        | ○ |
| Morocco                      | 74        | ○ |
| Scotland                     | 73        | ○ |
| Armenia                      | 72        | ○ |
| New Zealand                  | 72        | ○ |
| Australia                    | 71        | ○ |
| Netherlands                  | 71        | ○ |
| Belgium (Flemish)            | 62        | ▼ |
| Cyprus                       | 61        | ▼ |
| Norway                       | 55        | ▼ |
| Philippines                  | 54        | ▼ |
| Tunisia                      | 36        | ▼ |

Country average vs.  
International average:

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

Item Number: S031035

Correct Response:

D



| 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?

## 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        | ○ |
| Moldova, Republic of         | 68        | ○ |
| <b>International average</b> | <b>65</b> |   |
| Italy                        | 62        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031406A

## 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)

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

| 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?

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Lithuania                    | 45        | ▲ |
| Hungary                      | 38        | ▲ |
| Singapore                    | 38        | ▲ |
| Chinese Taipei               | 33        | ▲ |
| Japan                        | 28        | ▲ |
| Russian Federation           | 28        | ▲ |
| England                      | 27        | ▲ |
| <b>International average</b> | <b>19</b> |   |
| Australia                    | 18        | ○ |
| Hong Kong, SAR               | 18        | ○ |
| Latvia                       | 18        | ○ |
| New Zealand                  | 18        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031406B

## 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 (Part A: 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)

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.

| 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.

### 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        | ○ |
| New Zealand                  | 67        | ○ |
| Belgium (Flemish)            | 65        | ○ |
| <b>International average</b> | <b>63</b> |   |
| Italy                        | 61        | ○ |
| Cyprus                       | 59        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031409

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

| 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: \_\_\_\_\_

## 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        | ○ |
| Russian Federation           | 42        | ○ |
| Italy                        | 41        | ○ |
| Australia                    | 39        | ○ |
| United States                | 39        | ○ |
| Scotland                     | 38        | ○ |
| <b>International average</b> | <b>38</b> |   |
| New Zealand                  | 37        | ○ |
| Hungary                      | 35        | ○ |
| Slovenia                     | 35        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031053

## 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)

## 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

## 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: 1

Iron is material number: 2



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

Which bulb will light

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

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

**Overall Percent Correct**

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

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: S031038

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>C</b> |
|--------------------------|----------|

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

Figure where two magnets repel

Figure 1    S                      N    N                      S

Figure 2    S                      N    S                      N

Figure 3    N                      S    N                      S

Figure 4    N                      S    S                      N

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

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

**Overall Percent Correct**

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

**Country average vs. International average:**

Higher            ▲  
 Not different    ○  
 Lower             ▼

Item Number: S031306

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>C</b> |
|--------------------------|----------|

| Content Domain   | Main Topic                             | Cognitive Domain         |
|------------------|--|--------------------------|
| PHYSICAL SCIENCE | Energy Types, Sources, and Conversions | Conceptual Understanding |

## Renewable energy source

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

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

## Overall Percent Correct

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

Country average vs.  
International average:

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

Item Number: S011011

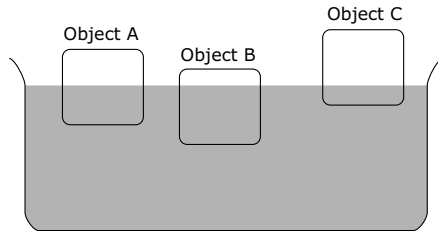
Correct Response:

B

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

## Objects floating in water

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



Which object weighs the most?

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

## Overall Percent Correct

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

Country average vs.  
International average:

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

Item Number: S011001

Correct Response:

**B**

| Content Domain   | Main Topic        | Cognitive Domain  |
|------------------|-------------------|-------------------|
| PHYSICAL SCIENCE | Forces and Motion | Factual Knowledge |

Which can make objects repel

Which of the following can make objects repel each other?

Ⓐ gravity

Ⓑ magnetism

Ⓒ both gravity and magnetism

Ⓓ neither gravity nor magnetism

### Overall Percent Correct

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

### Country average vs. International average:

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

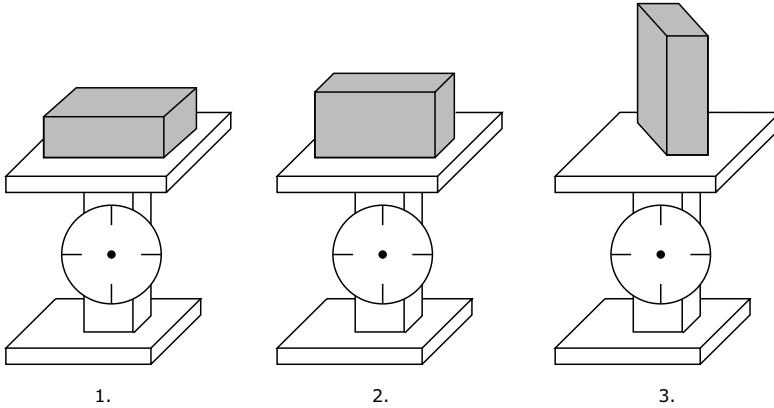
Item Number: S031313

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

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

## Weight on scale

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



What will the scale show?

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

## Overall Percent Correct

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

**Country average vs.  
International average:**

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

Item Number: S011009

Correct Response:

D

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

## Why made of copper

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

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

## Overall Percent Correct

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

Country average vs.  
International average:

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

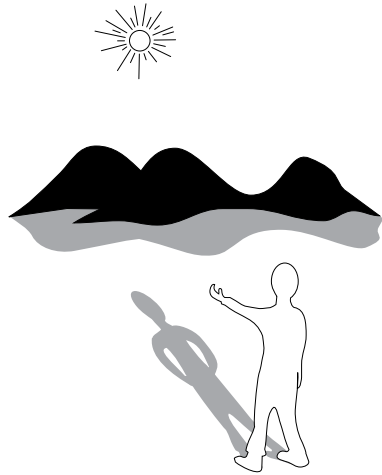
Item Number: S011014

Correct Response:

A

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

Two things wrong with the shadow



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

Write down the two things that are wrong.

1.

2.

Overall Percent Correct

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

Country average vs. International average:

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

Item Number: S031072



## Two things wrong with the shadow (continued)

Item Number: S031072

### SCORING

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

#### Fully Correct Response

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

- Other fully correct

#### Partial Response

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

#### Incorrect Response

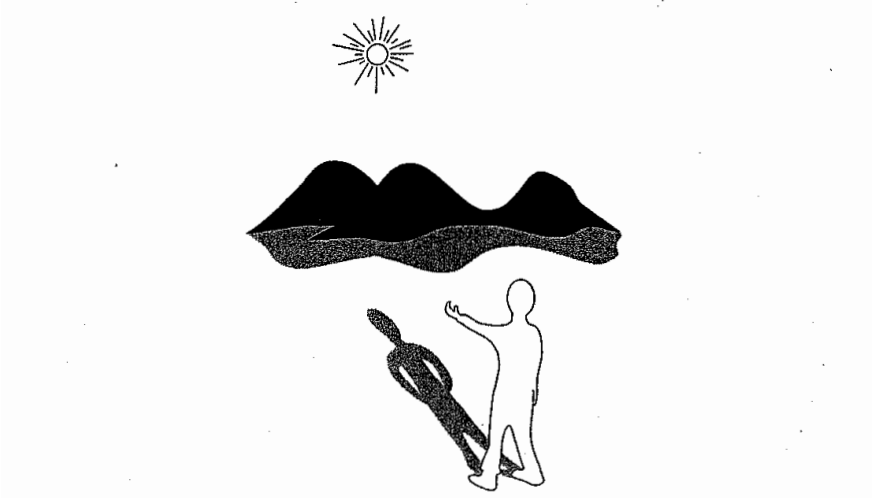
- Response too vague.  
*Examples: The shadow of the man. The shadow of the hill.*  
*The hands. The head.*
- Incorrect (including crossed out/erased, stray marks, illegible or off task)  
*Examples: He has no hair. He has no face.*

Two things wrong with the shadow (continued)

Item Number: S031072

Student Responses

Correct Response:



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

Write down the two things that are wrong.

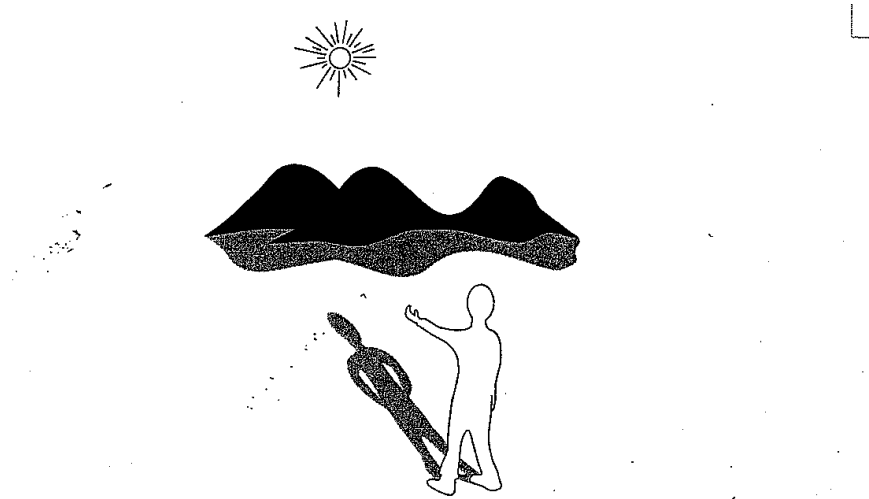
1. His arm isn't sticking out.
2. The shadow isn't behind him.  
It should be because the sun's in front of him.

Two things wrong with the shadow (continued)

Item Number: S031072

Student Responses (continued)

Partially Correct Response:



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

Write down the two things that are wrong.

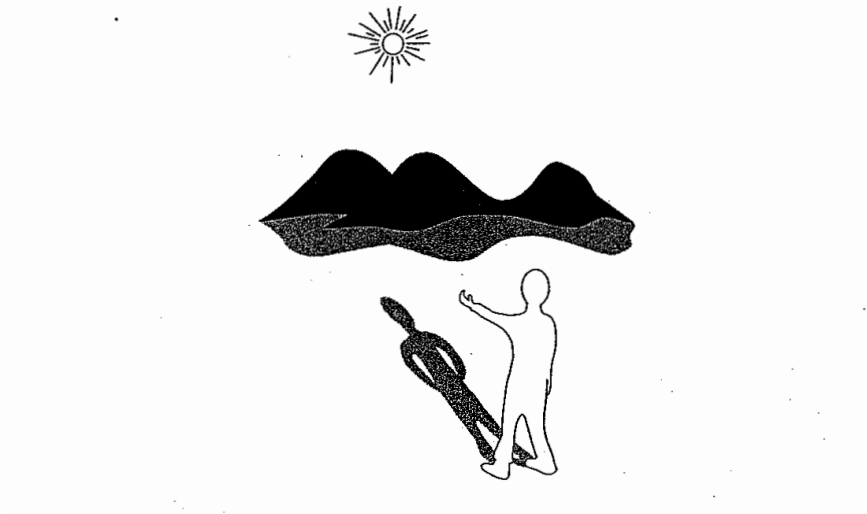
1. His head is wide not tall
2. His arm is in the air and the other one is tucked in

Two things wrong with the shadow (continued)

Item Number: S031072

**Student Responses** (continued)

**Incorrect Response:**



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

Write down the two things that are wrong.

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

| Content Domain   | Main Topic | Cognitive Domain  |
|------------------|------------|-------------------|
| PHYSICAL SCIENCE | Light      | Factual Knowledge |

Which could cause rainbow

Which pair together could cause a rainbow?

Ⓐ Fog and clouds

Ⓑ Rain and snow

Ⓒ Clouds and ice

Ⓓ Sunshine and rain

### Overall Percent Correct

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

### Country average vs. International average:

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

Item Number: S011029

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

| Content Domain   | Main Topic                            | Cognitive Domain         |
|------------------|---------------------------------------|--------------------------|
| PHYSICAL SCIENCE | Physical States and Changes in Matter | Conceptual Understanding |

## Soap bubbles

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

Ⓐ Air  
 Ⓑ Soap  
 Ⓒ Water  
 Ⓓ Nothing

## Overall Percent Correct

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

Country average vs.  
International average:

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

Item Number: S011017

Correct Response:

A

| Content Domain   | Main Topic                            | Cognitive Domain         |
|------------------|---------------------------------------|--------------------------|
| PHYSICAL SCIENCE | Physical States and Changes in Matter | Conceptual Understanding |

## Boiling water

What happens to water when it boils?

Ⓐ It changes color.

Ⓑ It becomes heavier.

Ⓒ It changes into water vapor.

Ⓓ It stops bubbling.

## Overall Percent Correct

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

Country average vs.  
International average:

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

Item Number: S011030

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

| Content Domain   | Main Topic                            | Cognitive Domain         |
|------------------|---------------------------------------|--------------------------|
| PHYSICAL SCIENCE | Physical States and Changes in Matter | Conceptual Understanding |

## Difference between solids and liquids

Describe one difference between solids and liquids.

## Overall Percent Correct

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

Item Number: S031370

## SCORING

## Correct Response

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

## Incorrect Response

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

Country average vs.  
International average:

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



Difference between solids and liquids (continued)

Item Number: S031370

**Student Responses**

**Correct Response:**

Describe one difference between solids and liquids.

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


**Incorrect Response:**

Describe one difference between solids and liquids.

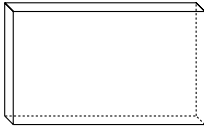
Solids are solid and liquid are like water.

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

Solid, liquid, and gas in a container/identify

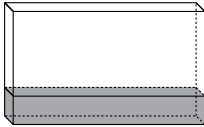


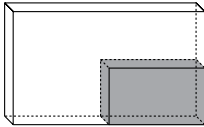
The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.




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

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







B. Explain your answers.

Overall Percent Correct

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

**Country average vs. International average:**

Higher ▲  
Not different ○  
Lower ▼

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)

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

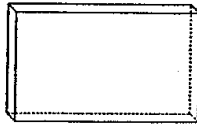
Item Number: S031372A

Student Responses

Correct Response:

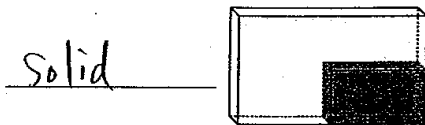
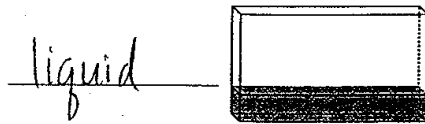


The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



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

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



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

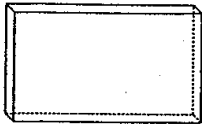
Item Number: S031372A

Student Responses (continued)

Incorrect Response:

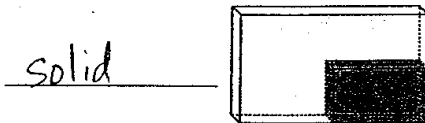
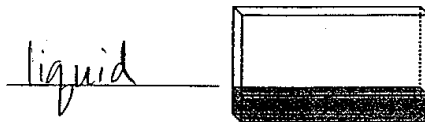


The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



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

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

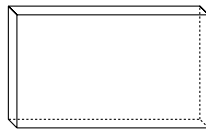


| Content Domain   | Main Topic                            | Cognitive Domain       |
|------------------|---------------------------------------|------------------------|
| PHYSICAL SCIENCE | Physical States and Changes in Matter | Reasoning and Analysis |

Solid, liquid, and gas in a container/explain

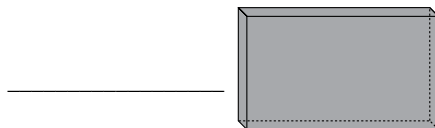
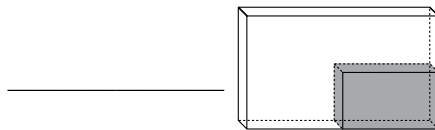
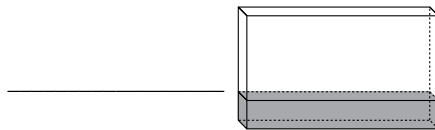


The figure **above** shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



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

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



B. Explain your answers.

Overall Percent Correct

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

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

Country average vs. International average:

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

Item Number: S031372B

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

Item Number: S031372B

### SCORING

#### Fully Correct Response

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

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

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

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

- Other fully correct

#### Partially Correct Response

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

*Examples: Solids remain the same, gases go everywhere.*

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

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

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

- Other partially correct

#### Incorrect Response

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

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

*Solids are heavier.*

*Blocks are made of solids.*

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

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

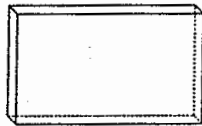
Item Number: S031372B

## Student Responses

## Correct Response:

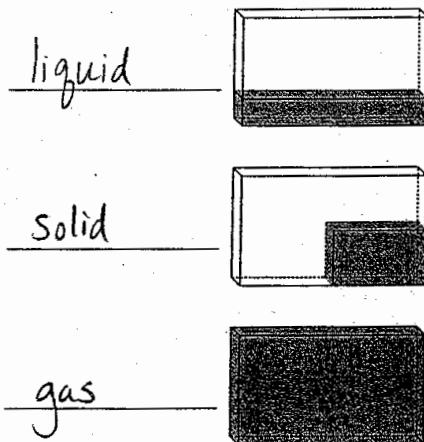


The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



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

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



- B. Explain your answers.

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

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

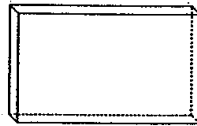
Item Number: S031372B

## Student Responses (continued)

## Partially Correct Response:

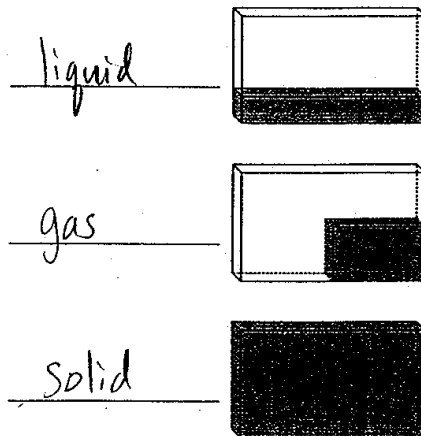


The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.



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

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



- B. Explain your answers.

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



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

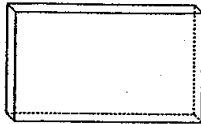
Item Number: S031372B

Student Responses (continued)

Incorrect Response:

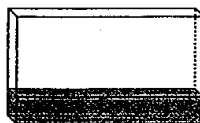



The figure above shows a box that contains a material that could be a solid, a liquid or a gas. The material is then put into a box four times as large.




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

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

liquid \_\_\_\_\_ 

solid \_\_\_\_\_ 

solid \_\_\_\_\_ 

B. Explain your answers.

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

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

### Closed glass bottle filled with water

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

Why did freezing the water cause the bottle to break?

### Overall Percent Correct

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

### Country average vs. International average:

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

Item Number: S031005

## SCORING

### Correct Response

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

### Incorrect Response

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

Closed glass bottle filled with water (continued)

Item Number: S031005

## Student Responses

### Correct Response:

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

Why did freezing the water cause the bottle to break?

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

### Incorrect Response:

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

Why did freezing the water cause the bottle to break?

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

| 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)?

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

| 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        | ○ |
| Netherlands                  | 70        | ○ |
| Slovenia                     | 70        | ○ |
| United States                | 70        | ○ |
| <b>International average</b> | <b>70</b> |   |
| Russian Federation           | 69        | ○ |
| Scotland                     | 69        | ○ |
| Armenia                      | 60        | ▼ |
| Philippines                  | 57        | ▼ |
| Cyprus                       | 52        | ▼ |
| Iran, Islamic Republic of    | 47        | ▼ |
| Tunisia                      | 42        | ▼ |
| Morocco                      | 35        | ▼ |

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

Item Number: S011027

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

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

Which is hottest

Which of these is hottest?

Ⓐ The Earth

Ⓑ Mars

Ⓒ The Moon

Ⓓ The Sun

**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        | ○ |
| Italy                        | 92        | ○ |
| <b>International average</b> | <b>91</b> |   |
| Japan                        | 90        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S011018

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>D</b> |
|--------------------------|----------|

| 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

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        | ○ |
| Australia                    | 69        | ○ |
| Belgium (Flemish)            | 69        | ○ |
| Italy                        | 68        | ○ |
| <b>International average</b> | <b>67</b> |   |
| New Zealand                  | 66        | ○ |
| Scotland                     | 66        | ○ |
| 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 ○

Lower ▼

Item Number: S011022

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

| 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

### Overall Percent Correct

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

### Country average vs. International average:

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

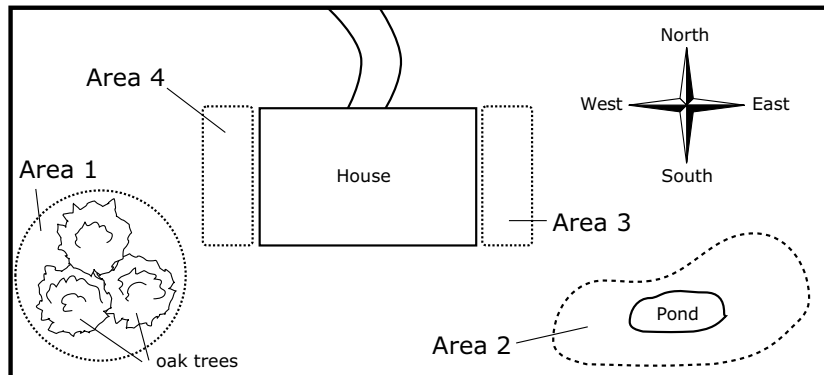
Item Number: S031060

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

| Content Domain       | Main Topic                             | Cognitive Domain       |
|----------------------|--|------------------------|
| <b>EARTH SCIENCE</b> | 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

### 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 is 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)

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Chinese Taipei               | 55        | ▲ |
| Hong Kong, SAR               | 51        | ▲ |
| Japan                        | 45        | ▲ |
| Singapore                    | 42        | ▲ |
| Hungary                      | 41        | ▲ |
| Latvia                       | 34        | ▲ |
| Netherlands                  | 33        | ▲ |
| Italy                        | 30        | ○ |
| Slovenia                     | 30        | ○ |
| United States                | 29        | ○ |
| Australia                    | 28        | ○ |
| Cyprus                       | 28        | ○ |
| New Zealand                  | 27        | ○ |
| <b>International average</b> | <b>26</b> |   |
| Lithuania                    | 23        | ○ |
| Belgium (Flemish)            | 22        | ○ |
| Russian Federation           | 21        | ▼ |
| England                      | 21        | ○ |
| 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 | ○ |
| Lower         | ▼ |



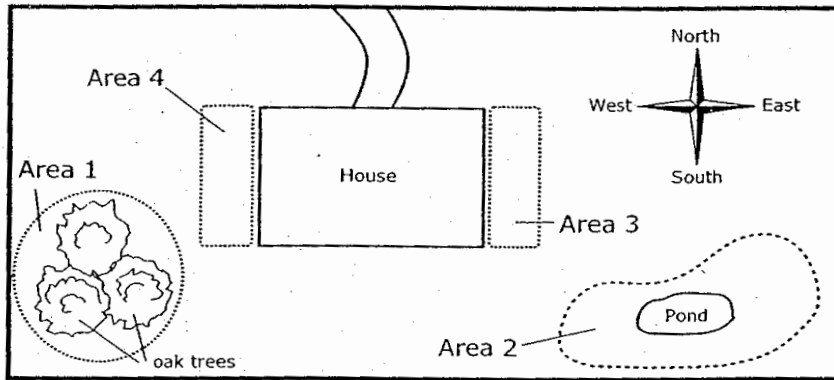
## Garden: which side of the house gets most sun (continued)

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.

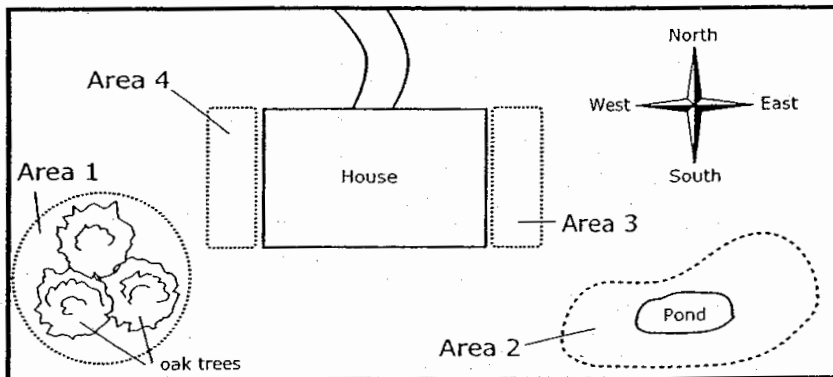
## Garden: which side of the house gets most sun (continued)

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.

| 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.

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        | ○ |
| Scotland                     | 48        | ○ |
| Cyprus                       | 47        | ○ |
| Hong Kong, SAR               | 47        | ○ |
| Norway                       | 45        | ○ |
| Hungary                      | 44        | ○ |
| <b>International average</b> | <b>44</b> |   |
| Armenia                      | 42        | ○ |
| 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                              | ○ |
| Lower                                      | ▼ |

Item Number: S011032

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)

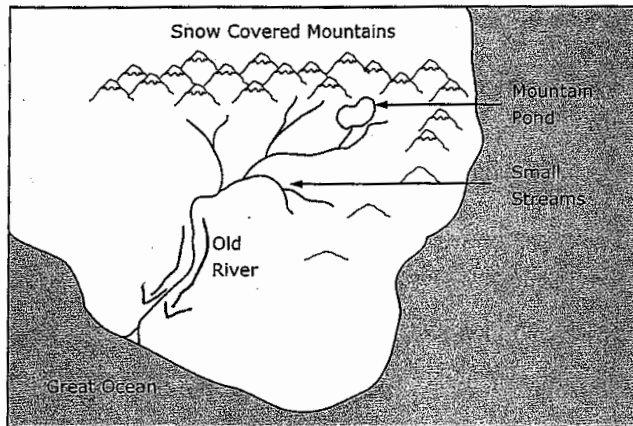
Direction of water (continued)

Item Number: S011032

Student Responses

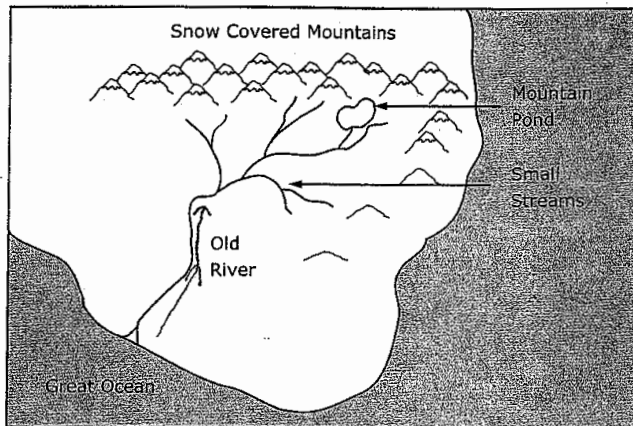
Correct Response:

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.



| 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?

### 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        | ○ |
| Norway                       | 49        | ○ |
| Moldova, Republic of         | 48        | ○ |
| New Zealand                  | 48        | ○ |
| Lithuania                    | 47        | ○ |
| Scotland                     | 47        | ○ |
| <b>International average</b> | <b>47</b> |   |
| Cyprus                       | 45        | ○ |
| Japan                        | 45        | ○ |
| Slovenia                     | 43        | ○ |
| Armenia                      | 37        | ▼ |
| Hong Kong, SAR               | 34        | ▼ |
| Iran, Islamic Republic of    | 28        | ▼ |
| Philippines                  | 20        | ▼ |
| Tunisia                      | 18        | ▼ |
| Morocco                      | 12        | ▼ |

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.*

#### Country average vs. International average:

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

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?

The water vapor freezes and becomes snow or ice.

**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?

It get really windy.

| Content Domain       | Main Topic                           | Cognitive Domain  |
|----------------------|--------------------------------------|-------------------|
| <b>EARTH SCIENCE</b> | 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.

**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        | ○ |
| <b>International average</b> | <b>76</b> |   |
| Cyprus                       | 75        | ○ |
| Norway                       | 75        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S011005

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>D</b> |
|--------------------------|----------|

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

Town where it is most likely to snow

|               | Clouds in the Sky | Lowest Temperature | Highest Temperature |
|---------------|-------------------|--------------------|---------------------|
| <b>Town A</b> | no                | 10°C               | 25°C                |
| <b>Town B</b> | yes               | 20°C               | 30°C                |
| <b>Town C</b> | no                | -10°C              | -1°C                |
| <b>Town D</b> | 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?

- (A) Town A
- (B) Town B
- (C) Town C
- (D) Town D

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Belgium (Flemish)            | 57        | ▲ |
| Japan                        | 56        | ▲ |
| Hungary                      | 54        | ▲ |
| Netherlands                  | 54        | ▲ |
| England                      | 49        | ▲ |
| Slovenia                     | 43        | ▲ |
| Cyprus                       | 40        | ▲ |
| Latvia                       | 40        | ○ |
| United States                | 40        | ▲ |
| Italy                        | 39        | ○ |
| Lithuania                    | 38        | ○ |
| Norway                       | 37        | ○ |
| Russian Federation           | 37        | ○ |
| Australia                    | 36        | ○ |
| New Zealand                  | 36        | ○ |
| <b>International average</b> | <b>36</b> |   |
| Singapore                    | 35        | ○ |
| Chinese Taipei               | 34        | ○ |
| Scotland                     | 34        | ○ |
| Moldova, Republic of         | 32        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031383

**Correct Response:**

**D**



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

**Saltiest water**

Look at this diagram.

The saltiest water is in the

- (A) Great Ocean
- (B) Mountain Pond
- (C) Old River
- (D) 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        | ○ |
| Netherlands                  | 76        | ○ |
| Australia                    | 74        | ○ |
| New Zealand                  | 73        | ○ |
| <b>International average</b> | <b>73</b> |   |
| Hong Kong, SAR               | 71        | ○ |
| 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                              | ○ |
| Lower                                      | ▼ |

**Correct Response: A**

| 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?

(A) Layer A  
 (B) Layer B  
 (C) Layer C  
 (D) 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        | ○ |
| Singapore                    | 76        | ○ |
| <b>International average</b> | <b>76</b> |   |
| Lithuania                    | 75        | ○ |
| Cyprus                       | 73        | ○ |
| Russian Federation           | 70        | ▼ |
| Armenia                      | 65        | ▼ |
| Morocco                      | 52        | ▼ |
| Iran, Islamic Republic of    | 51        | ▼ |
| Philippines                  | 48        | ▼ |
| Tunisia                      | 47        | ▼ |

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

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

| 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?

The image shows four rocks in a riverbed, each with a circled letter next to it. Rock A is a large, dark, angular rock with a rough, pitted surface. Rock B is a small, dark, smooth, rounded rock. Rock C is a medium-sized, dark, smooth, rounded rock. Rock D is a large, dark, angular rock with a rough, pitted surface, similar to rock A.

| 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        | ○ |
| Slovenia                     | 71        | ○ |
| Scotland                     | 70        | ○ |
| <b>International average</b> | <b>69</b> |   |
| Hong Kong, SAR               | 68        | ○ |
| 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                              | ○ |
| Lower                                      | ▼ |

Item Number: S031082

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

| Content Domain       | Main Topic                              | Cognitive Domain  |
|----------------------|---|-------------------|
| <b>EARTH SCIENCE</b> | 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

## 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        | ○ |
| Hong Kong, SAR               | 71        | ○ |
| Italy                        | 71        | ○ |
| <b>International average</b> | <b>68</b> |   |
| Belgium (Flemish)            | 65        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S011003

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>A</b> |
|--------------------------|----------|

| Content Domain       | Main Topic                              | Cognitive Domain  |
|----------------------|---|-------------------|
| <b>EARTH SCIENCE</b> | 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

## 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        | ○ |
| Latvia                       | 85        | ○ |
| <b>International average</b> | <b>84</b> |   |
| Norway                       | 82        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S011012

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>B</b> |
|--------------------------|----------|

| Content Domain       | Main Topic                              | Cognitive Domain  |
|----------------------|---|-------------------|
| <b>EARTH SCIENCE</b> | 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

## Overall Percent Correct

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

Country average vs.  
International average:

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

Item Number: S011013

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>E</b> |
|--------------------------|----------|

| 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.

Before Test

After Test

(A) (B) (C) (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        | ○ |
| <b>International average</b> | <b>66</b> |   |
| Hungary                      | 65        | ○ |
| Cyprus                       | 64        | ○ |
| Moldova, Republic of         | 61        | ○ |
| Lithuania                    | 59        | ▼ |
| Armenia                      | 47        | ▼ |
| Iran, Islamic Republic of    | 38        | ▼ |
| Philippines                  | 36        | ▼ |
| Morocco                      | 26        | ▼ |
| Tunisia                      | 20        | ▼ |

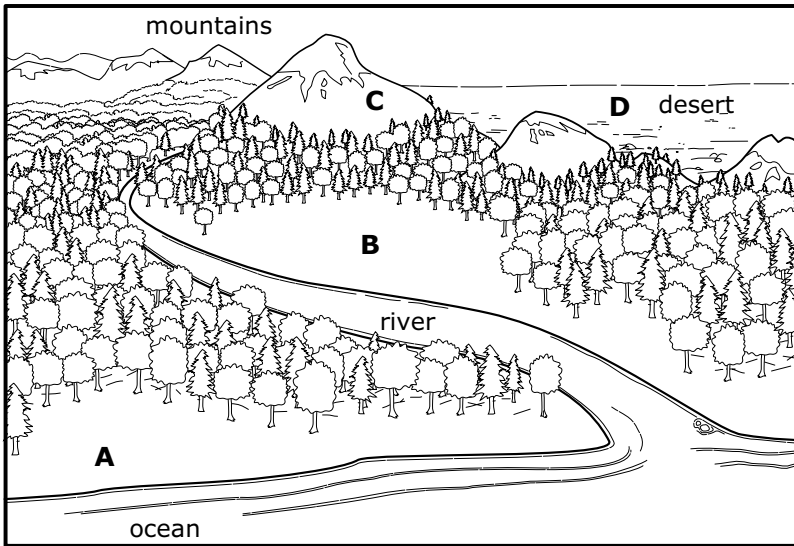
| Country average vs. International average: |   |
|--|---|
| Higher                                     | ▲ |
| Not different                              | ○ |
| Lower                                      | ▼ |

Item Number: S011023

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

| Content Domain       | Main Topic                              | Cognitive Domain       |
|----------------------|---|------------------------|
| <b>EARTH SCIENCE</b> | 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?

- (A) Location A
- (B) Location B
- (C) Location C
- (D) Location D

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        | ○ |
| <b>International average</b> | <b>57</b> |   |
| Slovenia                     | 56        | ○ |
| Moldova, Republic of         | 54        | ○ |
| Belgium (Flemish)            | 44        | ▼ |
| Armenia                      | 34        | ▼ |
| Iran, Islamic Republic of    | 32        | ▼ |
| Morocco                      | 27        | ▼ |
| Philippines                  | 24        | ▼ |
| Tunisia                      | 22        | ▼ |

Country average vs. International average:

- Higher ▲
- Not different ○
- Lower ▼

Item Number: S031379

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>B</b> |
|--------------------------|----------|



| 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.

## 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        | ○ |
| Moldova, Republic of         | 75        | ○ |
| <b>International average</b> | <b>73</b> |   |
| Norway                       | 70        | ○ |
| Hungary                      | 69        | ○ |
| Italy                        | 69        | ○ |
| Armenia                      | 57        | ▼ |
| Tunisia                      | 43        | ▼ |
| Iran, Islamic Republic of    | 40        | ▼ |
| Philippines                  | 40        | ▼ |
| Morocco                      | 22        | ▼ |

Country average vs.  
International average:

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

Item Number: S011019

## 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)

Plants and fish in river (continued)

Item Number: S011019

Student Responses

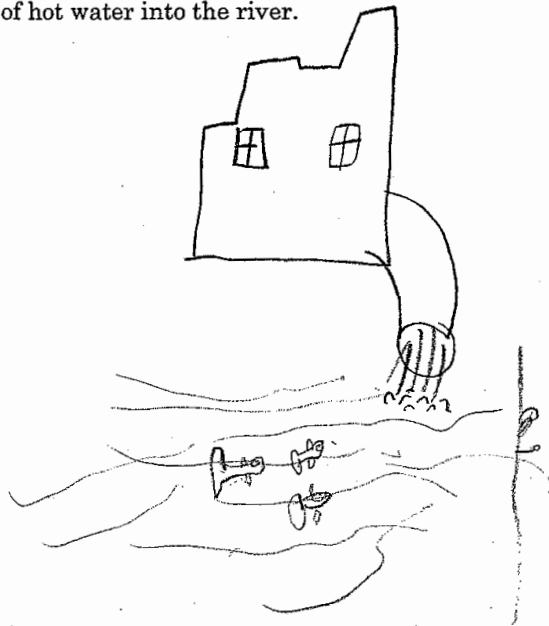
Correct Response:

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.



| 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?

- (A) from air
- (B) from wood
- (C) from rocks
- (D) from crops

## 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        | ○ |
| Slovenia                     | 59        | ○ |
| England                      | 59        | ○ |
| <b>International average</b> | <b>59</b> |   |
| Belgium (Flemish)            | 58        | ○ |
| Australia                    | 57        | ○ |
| Lithuania                    | 57        | ○ |
| 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 | ○ |
| Lower         | ▼ |

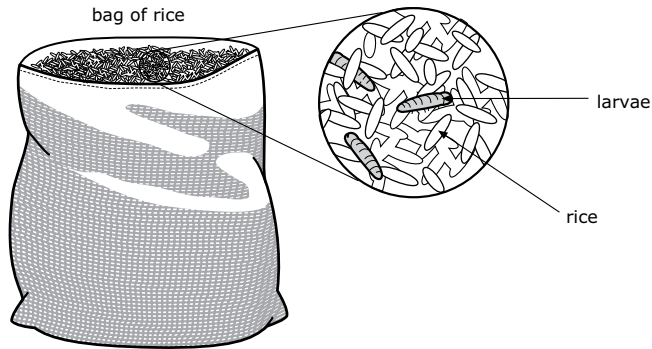
Item Number: S031398

Correct Response:

C

| 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?

- (A) They came from water in the bag.
- (B) They came from air in the bag.
- (C) They came from the rice itself.
- (D) They came from eggs laid by insects.

## 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        | ○ |
| United States                | 69        | ○ |
| Scotland                     | 69        | ○ |
| Moldova, Republic of         | 68        | ○ |
| <b>International average</b> | <b>67</b> |   |
| Hong Kong, SAR               | 66        | ○ |
| Iran, Islamic Republic of    | 63        | ○ |
| Italy                        | 61        | ▼ |
| Philippines                  | 52        | ▼ |
| Cyprus                       | 49        | ▼ |
| Tunisia                      | 40        | ▼ |
| Armenia                      | 36        | ▼ |
| Morocco                      | 31        | ▼ |

Country average vs.  
International average:

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

Item Number: S031003

Correct Response:

D

| 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.

## 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        | ○ |
| Lithuania                    | 29        | ○ |
| Hungary                      | 28        | ○ |
| Scotland                     | 28        | ○ |
| New Zealand                  | 27        | ○ |
| <b>International average</b> | <b>27</b> |   |
| Moldova, Republic of         | 26        | ○ |
| Cyprus                       | 22        | ▼ |
| Slovenia                     | 17        | ▼ |
| Hong Kong, SAR               | 16        | ▼ |
| Armenia                      | 14        | ▼ |
| Morocco                      | 10        | ▼ |
| Tunisia                      | 9         | ▼ |
| Iran, Islamic Republic of    | 7         | ▼ |
| Philippines                  | 6         | ▼ |

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.*

Country average vs.  
International average:

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

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.

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

Organisms that give birth or lay eggs

human, frog, dog, butterfly, bird, whale

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 |
|---------------------------|-------------------------|
|                           |                         |

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        | ○ |
| Scotland                     | 59        | ○ |
| Hong Kong, SAR               | 58        | ○ |
| Norway                       | 58        | ○ |
| <b>International average</b> | <b>58</b> |   |
| Cyprus                       | 54        | ○ |
| 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                              | ○ |
| Lower                                      | ▼ |

Item Number: S031252

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

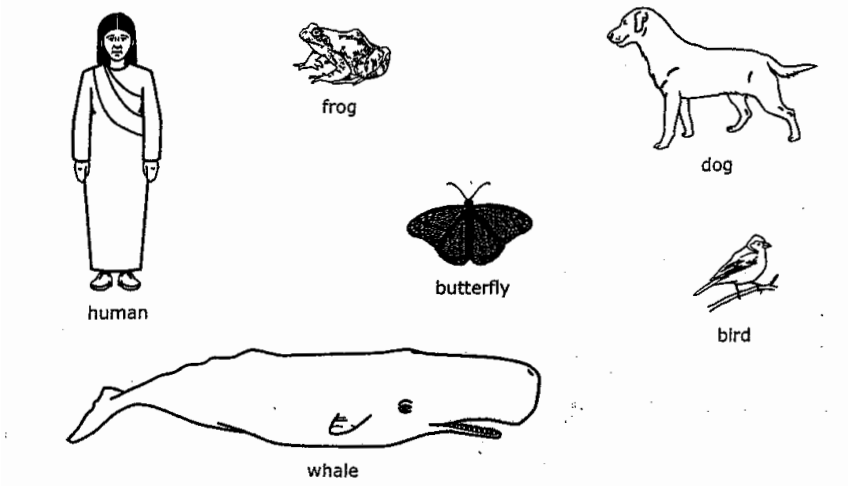
- Incorrect (including crossed out/erased, stray marks, illegible or off task)

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 |

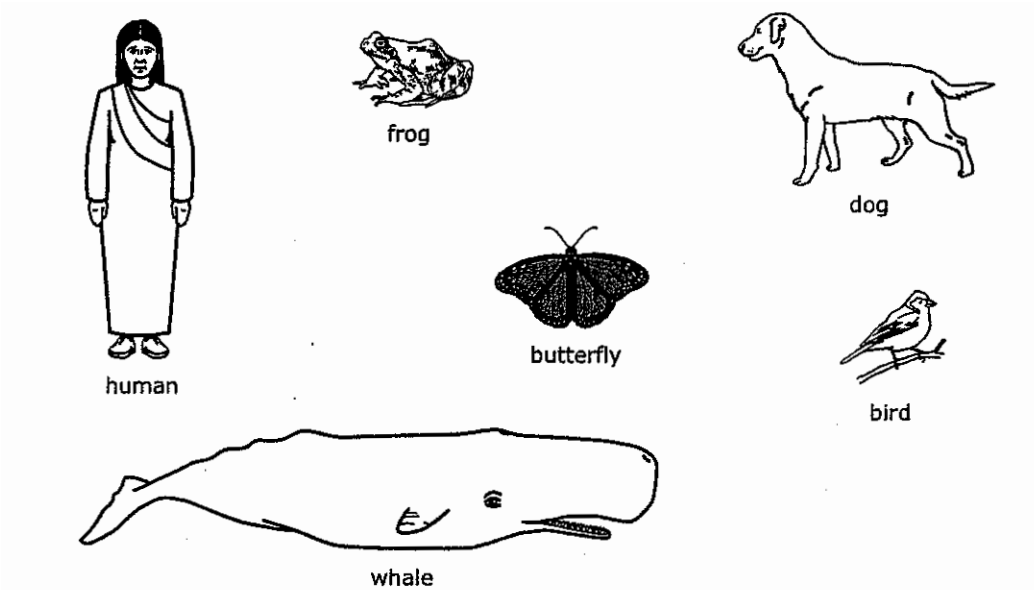


Organisms that give birth or lay eggs (continued)

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.

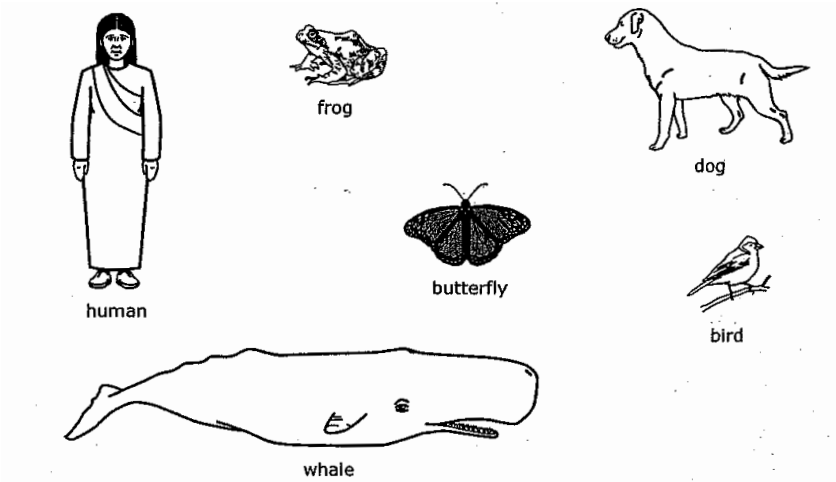
| Organisms that give birth | Organisms that lay eggs            |
|---------------------------|------------------------------------|
| human<br>dog              | bird<br>frog<br>whale<br>butterfly |

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.

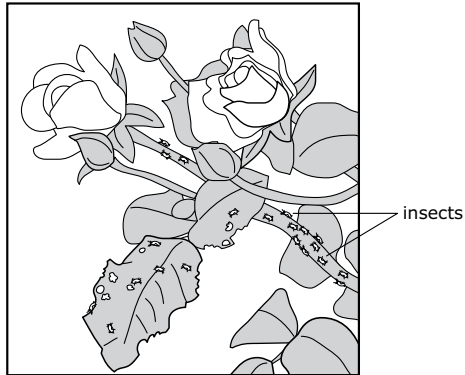
In the table below, write down the names of the organisms that belong to each group.

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

| 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?

### Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Russian Federation           | 41        | ▲ |
| Hungary                      | 39        | ▲ |
| Latvia                       | 37        | ▲ |
| Netherlands                  | 33        | ▲ |
| Italy                        | 28        | ▲ |
| Lithuania                    | 28        | ▲ |
| United States                | 27        | ▲ |
| Australia                    | 26        | ○ |
| Chinese Taipei               | 24        | ○ |
| Japan                        | 24        | ○ |
| Belgium (Flemish)            | 24        | ○ |
| England                      | 22        | ○ |
| Slovenia                     | 21        | ○ |
| <b>International average</b> | <b>21</b> |   |
| Hong Kong, SAR               | 19        | ○ |
| New Zealand                  | 19        | ○ |
| Singapore                    | 18        | ○ |
| Moldova, Republic of         | 17        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031443

### 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.

## 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)

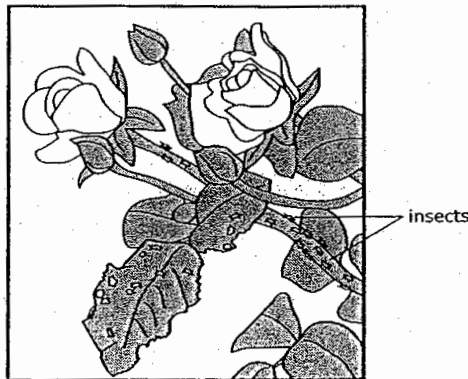
Garden: why insects are important for flowering plants (continued)

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 pollinate flowers

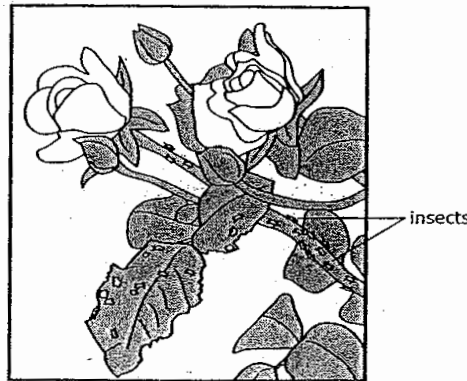
Garden: why insects are important for flowering plants (continued)

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.


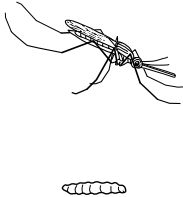
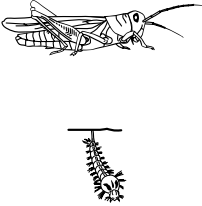

Why are some insects important for flowering plants?

Bee's are inportent because they need pollen.

| 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?

|   |   |   |   |
|---|---|---|---|
| Housefly  | Mosquito  | Grasshopper   | Butterfly   |
|  |  |  |  |
| (A)   | (B)   | (C)   | (D)   |

**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        | ○ |
| Hong Kong, SAR               | 76        | ○ |
| Belgium (Flemish)            | 75        | ○ |
| Latvia                       | 74        | ○ |
| Netherlands                  | 73        | ○ |
| <b>International average</b> | <b>73</b> |   |
| Cyprus                       | 72        | ○ |
| Italy                        | 71        | ○ |
| Moldova, Republic of         | 70        | ○ |
| Slovenia                     | 69        | ○ |
| Lithuania                    | 66        | ▼ |
| Philippines                  | 62        | ▼ |
| Armenia                      | 55        | ▼ |
| Iran, Islamic Republic of    | 51        | ▼ |
| Tunisia                      | 26        | ▼ |
| Morocco                      | 0         | ▼ |

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: S031017

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>D</b> |
|--------------------------|----------|

| 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?

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

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        | ○ |
| <b>International average</b> | <b>63</b> |   |
| Chinese Taipei               | 62        | ○ |
| Hong Kong, SAR               | 54        | ▼ |
| Slovenia                     | 47        | ▼ |
| Armenia                      | 41        | ▼ |
| Japan                        | 39        | ▼ |
| Philippines                  | 38        | ▼ |
| Cyprus                       | 35        | ▼ |
| Iran, Islamic Republic of    | 29        | ▼ |
| Morocco                      | 26        | ▼ |
| Tunisia                      | 23        | ▼ |

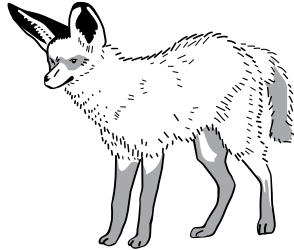
| Country average vs. International average: |   |
|--|---|
| Higher                                     | ▲ |
| Not different                              | ○ |
| Lower                                      | ▼ |

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|



| 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) a thick coat of fur
- (B) a bushy tail
- (C) small eyes
- (D) large ears

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Lithuania                    | 52        | ▲ |
| Latvia                       | 48        | ▲ |
| Scotland                     | 48        | ▲ |
| United States                | 44        | ▲ |
| England                      | 44        | ▲ |
| Norway                       | 41        | ▲ |
| New Zealand                  | 40        | ▲ |
| Australia                    | 38        | ○ |
| Russian Federation           | 37        | ○ |
| Slovenia                     | 36        | ○ |
| Japan                        | 35        | ○ |
| Belgium (Flemish)            | 35        | ○ |
| Netherlands                  | 34        | ○ |
| <b>International average</b> | <b>33</b> |   |
| Chinese Taipei               | 29        | ▼ |
| Morocco                      | 29        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031284

Correct Response:

D

| Content Domain                     | Main Topic   | Cognitive Domain                              |
|------------------------------------|--|---|
| A. LIFE SCIENCE<br>B. LIFE SCIENCE | Ecosystems<br>Types, Characteristics,<br>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

## Overall Percent Correct

|                              |           |   |
|------------------------------|-----------|---|
| Singapore                    | 69        | ▲ |
| Hong Kong, SAR               | 40        | ▲ |
| Chinese Taipei               | 32        | ▲ |
| Italy                        | 28        | ▲ |
| United States                | 25        | ▲ |
| Hungary                      | 20        | ○ |
| Moldova, Republic of         | 20        | ○ |
| England                      | 20        | ○ |
| <b>International average</b> | <b>16</b> |   |
| Iran, Islamic Republic of    | 15        | ○ |
| Armenia                      | 14        | ○ |
| Japan                        | 13        | ▼ |
| Latvia                       | 13        | ○ |
| 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         | ▼ |

## 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)

Country average vs.  
International average:

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

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?

They need it so they can  
do harsh photosynthesis.

**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?

Because heat makes  
things bigger

| Content Domain                     | Main Topic   | Cognitive Domain                              |
|------------------------------------|--|---|
| A. LIFE SCIENCE<br>B. LIFE SCIENCE | Ecosystems<br>Types, Characteristics,<br>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        | ○ |
| Slovenia                     | 50        | ○ |
| Scotland                     | 49        | ○ |
| Hong Kong, SAR               | 48        | ○ |
| New Zealand                  | 48        | ○ |
| Italy                        | 45        | ○ |
| <b>International average</b> | <b>45</b> |   |
| Russian Federation           | 43        | ○ |
| Belgium (Flemish)            | 42        | ○ |
| 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 | ○ |
| Lower         | ▼ |

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.

They need carbon dioxide.

### 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.

c. they need shade and sun

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

## Herbivorous animal

Which animal eats only plants?

Ⓐ Cat

Ⓑ Dog

Ⓒ Lion

Ⓓ Rabbit

## 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        | ○ |
| Cyprus                       | 94        | ▲ |
| Netherlands                  | 94        | ○ |
| New Zealand                  | 94        | ○ |
| Slovenia                     | 94        | ○ |
| United States                | 94        | ▲ |
| Australia                    | 92        | ○ |
| Norway                       | 92        | ○ |
| England                      | 92        | ○ |
| Belgium (Flemish)            | 92        | ○ |
| <b>International average</b> | <b>92</b> |   |
| Moldova, Republic of         | 91        | ○ |
| Japan                        | 90        | ▼ |
| Scotland                     | 90        | ▼ |
| Iran, Islamic Republic of    | 88        | ▼ |
| Morocco                      | 82        | ▼ |
| Tunisia                      | 82        | ▼ |
| Philippines                  | 77        | ▼ |

Country average vs.  
International average:

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

Item Number: S011010

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

| 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?

(A) sun  
 (B) fish  
 (C) duckweed plant  
 (D) 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        | ○ |
| <b>International average</b> | <b>72</b> |   |
| Cyprus                       | 65        | ▼ |
| Slovenia                     | 65        | ▼ |
| Latvia                       | 61        | ▼ |
| Iran, Islamic Republic of    | 57        | ▼ |
| Armenia                      | 49        | ▼ |
| Morocco                      | 47        | ▼ |
| Philippines                  | 43        | ▼ |
| Tunisia                      | 35        | ▼ |

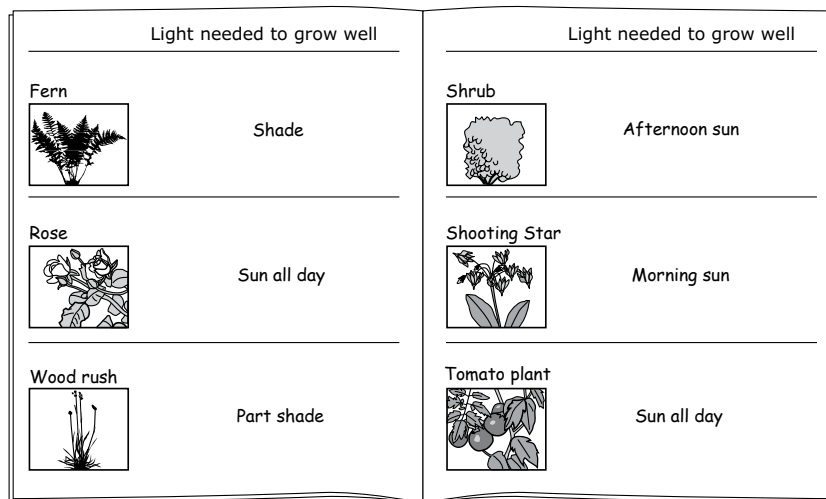
| Country average vs. International average: |   |
|--|---|
| Higher                                     | ▲ |
| Not different                              | ○ |
| Lower                                      | ▼ |

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

| 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

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        | ○ |
| Russian Federation           | 60        | ○ |
| Scotland                     | 57        | ○ |
| <b>International average</b> | <b>55</b> |   |
| Slovenia                     | 52        | ○ |
| Italy                        | 51        | ○ |
| Moldova, Republic of         | 50        | ○ |
| Cyprus                       | 43        | ▼ |
| Norway                       | 42        | ▼ |
| Iran, Islamic Republic of    | 27        | ▼ |
| Philippines                  | 19        | ▼ |
| Armenia                      | 17        | ▼ |
| Tunisia                      | 9         | ▼ |
| Morocco                      | 8         | ▼ |

Country average vs. International average:

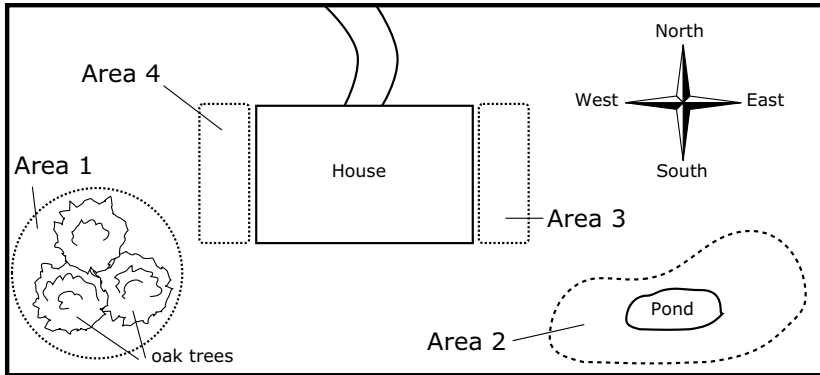
|               |   |
|---------------|---|
| Higher        | ▲ |
| Not different | ○ |
| Lower         | ▼ |

Item Number: S031441A



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

## 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)







## 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<br>       | Shade       | Shrub<br>         | Afternoon sun |
| Rose<br>       | Sun all day | Shooting Star<br> | Morning sun   |
| Wood rush<br> | Part shade  | Tomato plant<br> | 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!







## 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.

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

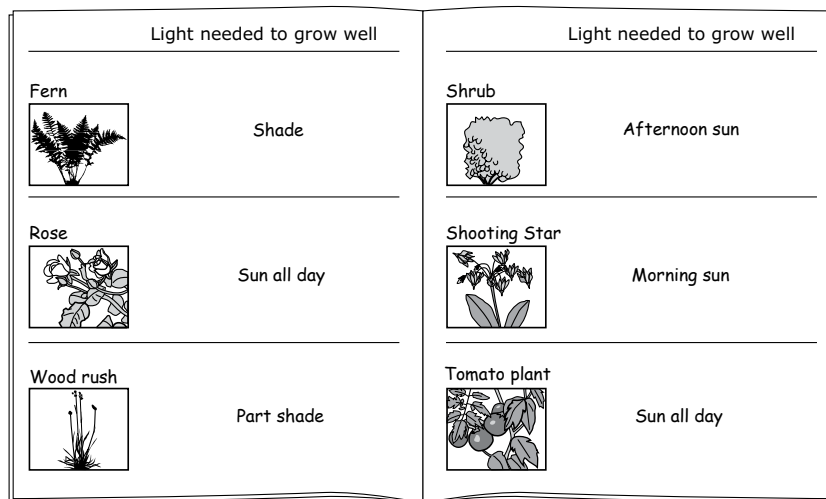
- A. Rebecca wanted to grow roses in Area 1 under the oak trees. Her friend Gwen disagreed and told her that the roses would **not** grow well in Area 1. Explain why Gwen says this.

*She cannot grow them under the oak trees.*

| 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

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        | ○ |
| Singapore                    | 18        | ▲ |
| Belgium (Flemish)            | 18        | ▲ |
| Hong Kong, SAR               | 15        | ○ |
| Slovenia                     | 14        | ○ |
| <b>International average</b> | <b>13</b> |   |
| Italy                        | 12        | ○ |
| Scotland                     | 11        | ○ |
| Lithuania                    | 9         | ▼ |
| Norway                       | 7         | ▼ |
| Moldova, Republic of         | 6         | ▼ |
| Cyprus                       | 4         | ▼ |
| Armenia                      | 2         | ▼ |
| Iran, Islamic Republic of    | 2         | ▼ |
| Morocco                      | 2         | ▼ |
| Tunisia                      | 2         | ▼ |
| Philippines                  | 1         | ▼ |

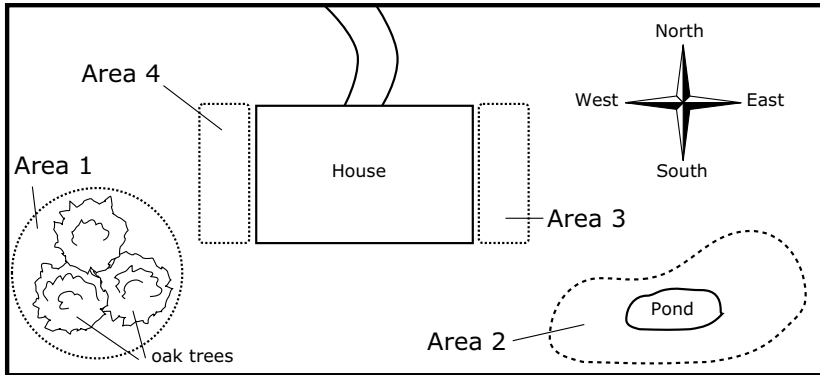
Country average vs. International average:

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

Item Number: S031441B

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

## 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

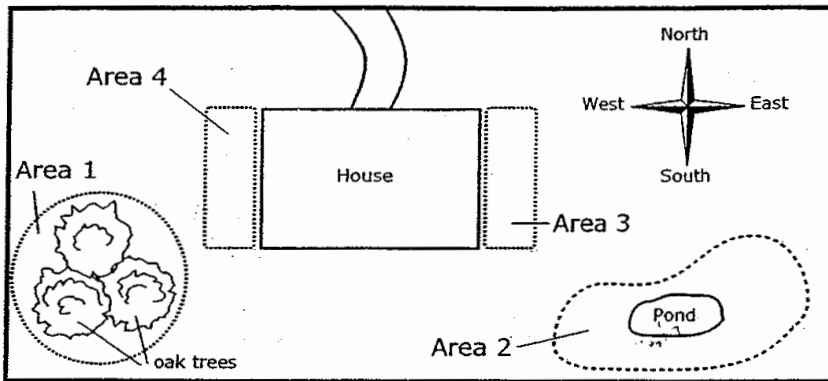
- Incorrect (including crossed out/erased, stray marks, illegible or off task)

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               |

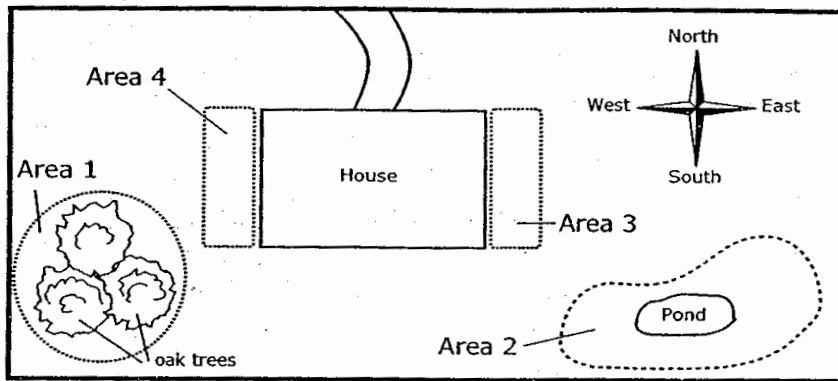


Garden: plants that grow well in four areas (continued)

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.

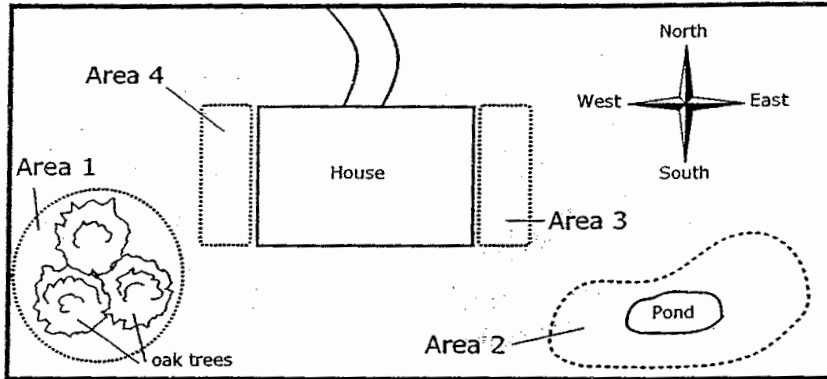
|        |                             |
|--------|-----------------------------|
| Area 1 | wood rush and Scrub<br>Fern |
| Area 2 | Rose                        |
| Area 3 | shooting<br>star            |
| Area 4 | tomato<br>plant             |

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 after noon 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.  |

| 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?

- (A) It washes away germs.
- (B) It makes your hands look nice.
- (C) It keeps your skin from drying out.
- (D) It makes your hands warmer.

## 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        | ○ |
| Netherlands                  | 87        | ○ |
| Hungary                      | 86        | ○ |
| Norway                       | 86        | ○ |
| <b>International average</b> | <b>86</b> |   |
| Iran, Islamic Republic of    | 84        | ○ |
| Moldova, Republic of         | 84        | ○ |
| Armenia                      | 69        | ▼ |
| Belgium (Flemish)            | 67        | ▼ |
| Philippines                  | 62        | ▼ |
| Morocco                      | 58        | ▼ |
| Tunisia                      | 47        | ▼ |

Country average vs.  
International average:

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

Item Number: S011031

Correct Response:

A

| 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        | ○ |
| Japan                        | 67        | ○ |
| Chinese Taipei               | 66        | ○ |
| <b>International average</b> | <b>65</b> |   |
| Hong Kong, SAR               | 61        | ○ |
| 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 | ○ |
| Lower         | ▼ |

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.

skincancer

**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.

burn up and die.

| 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

## 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        | ○ |
| England                      | 84        | ○ |
| Scotland                     | 84        | ○ |
| Norway                       | 83        | ○ |
| Slovenia                     | 83        | ○ |
| <b>International average</b> | <b>82</b> |   |
| Netherlands                  | 80        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S011021

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

| 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

## 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        | ○ |
| New Zealand                  | 44        | ○ |
| <b>International average</b> | <b>43</b> |   |
| Iran, Islamic Republic of    | 42        | ○ |
| Australia                    | 41        | ○ |
| Singapore                    | 41        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S011033

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

| 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?

(A) The sunshine colored the flowers yellow.

(B) The flowers of the parent plants were yellow.

(C) It was very warm when they flowered.

(D) It rained every day.

### 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        | ○ |
| Netherlands                  | 57        | ○ |
| England                      | 56        | ○ |
| Norway                       | 54        | ○ |
| <b>International average</b> | <b>54</b> |   |
| Chinese Taipei               | 53        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031269

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|



| 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.

## 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        | ○ |
| Slovenia                     | 71        | ○ |
| Chinese Taipei               | 70        | ○ |
| <b>International average</b> | <b>69</b> |   |
| Australia                    | 68        | ○ |
| Armenia                      | 58        | ▼ |
| Cyprus                       | 56        | ▼ |
| Iran, Islamic Republic of    | 46        | ▼ |
| Tunisia                      | 41        | ▼ |
| Philippines                  | 40        | ▼ |
| Morocco                      | 39        | ▼ |

Country average vs.  
International average:

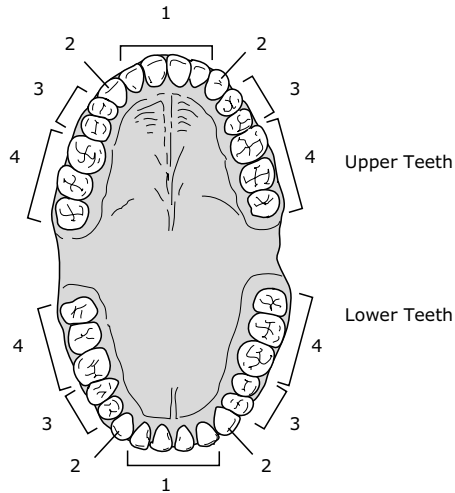
|               |   |
|---------------|---|
| Higher        | ▲ |
| Not different | ○ |
| Lower         | ▼ |

Item Number: S011004

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

| 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

- (A) 1 only
- (B) 3 only
- (C) 1 and 2
- (D) 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        | ▲ |
| <b>International average</b> | <b>74</b> |   |
| England                      | 73        | ○ |
| Cyprus                       | 72        | ○ |
| Iran, Islamic Republic of    | 72        | ○ |
| New Zealand                  | 71        | ○ |
| Armenia                      | 70        | ▼ |
| Italy                        | 70        | ○ |
| Scotland                     | 70        | ○ |
| Norway                       | 69        | ▼ |
| Australia                    | 68        | ▼ |
| Slovenia                     | 68        | ▼ |
| Philippines                  | 54        | ▼ |
| Tunisia                      | 45        | ▼ |
| Morocco                      | 43        | ▼ |

Country average vs. International average:

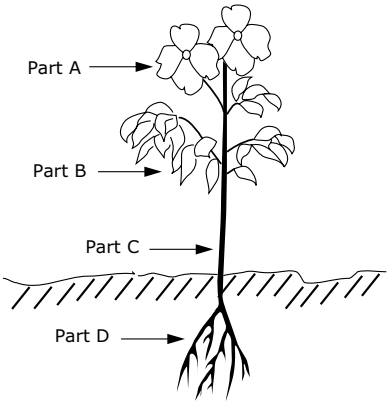
- Higher ▲
- Not different ○
- Lower ▼

**Correct Response: D**

| 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 →

(A) Part A

(B) Part B

(C) Part C

(D) Part D

Item Number: S011026

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

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

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

| 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.

### 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        | ○ |
| Singapore                    | 25        | ○ |
| Norway                       | 24        | ○ |
| Slovenia                     | 24        | ○ |
| <b>International average</b> | <b>24</b> |   |
| Armenia                      | 21        | ○ |
| 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 | ○ |
| Lower         | ▼ |

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.*

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.

| 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

## 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        | ○ |
| Belgium (Flemish)            | 84        | ○ |
| <b>International average</b> | <b>83</b> |   |
| Iran, Islamic Republic of    | 81        | ○ |
| Armenia                      | 76        | ▼ |
| Tunisia                      | 68        | ▼ |
| Chinese Taipei               | 67        | ▼ |
| Morocco                      | 67        | ▼ |
| Japan                        | 58        | ▼ |
| Philippines                  | 39        | ▼ |

Country average vs.  
International average:

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

Item Number: S011025

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

| 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

## 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        | ○ |
| Latvia                       | 61        | ○ |
| <b>International average</b> | <b>59</b> |   |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S012033

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

| 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

## 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        | ○ |
| Australia                    | 67        | ○ |
| <b>International average</b> | <b>67</b> |   |
| United States                | 65        | ○ |
| Italy                        | 63        | ○ |
| New Zealand                  | 63        | ▼ |
| Scotland                     | 63        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S012010

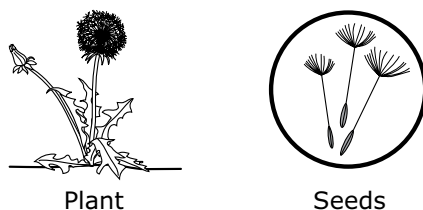
|                   |   |
|-------------------|---|
| Correct Response: | C |
|-------------------|---|



| 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.



How did the seeds most likely get into her garden?

## 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        | ○ |
| Italy                        | 42        | ○ |
| <b>International average</b> | <b>42</b> |   |
| Moldova, Republic of         | 40        | ○ |
| Australia                    | 39        | ○ |
| Singapore                    | 39        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031442

## 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)

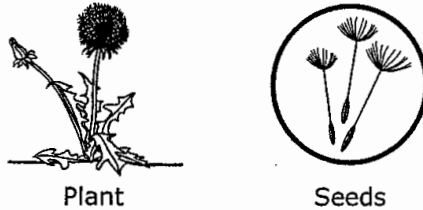
## Garden: how seeds get into garden (continued)

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.

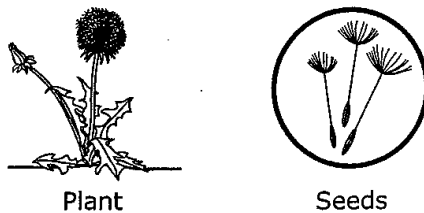


How did the seeds most likely get into her garden?

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.



How did the seeds most likely get into her garden?

The seeds fell from certain trees.

| 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

### 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        | ○ |
| Netherlands                  | 91        | ○ |
| Slovenia                     | 91        | ○ |
| Hungary                      | 90        | ○ |
| Hong Kong, SAR               | 89        | ○ |
| <b>International average</b> | <b>89</b> |   |
| Cyprus                       | 88        | ○ |
| Armenia                      | 82        | ▼ |
| Iran, Islamic Republic of    | 79        | ▼ |
| Philippines                  | 75        | ▼ |
| Morocco                      | 69        | ▼ |
| Tunisia                      | 52        | ▼ |

### Country average vs. International average:

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

Item Number: S011016

|                   |          |
|-------------------|----------|
| Correct Response: | <b>B</b> |
|-------------------|----------|

| 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        | ○ |
| Lithuania                    | 55        | ○ |
| <b>International average</b> | <b>53</b> |   |
| Scotland                     | 50        | ○ |
| 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 | ○ |
| Lower         | ▼ |

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.

| 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

### 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        | ○ |
| United States                | 72        | ▲ |
| England                      | 72        | ○ |
| Cyprus                       | 69        | ○ |
| Scotland                     | 69        | ○ |
| <b>International average</b> | <b>69</b> |   |
| Australia                    | 65        | ○ |
| 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 | ○ |
| Lower         | ▼ |

Item Number: S031212

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

| 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

(A) 1 and 3 only  
 (B) 1 and 4 only  
 (C) 2 and 4 only  
 (D) 3 and 4 only

**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        | ○ |
| Hong Kong, SAR               | 81        | ○ |
| <b>International average</b> | <b>81</b> |   |
| Slovenia                     | 79        | ○ |
| Iran, Islamic Republic of    | 76        | ▼ |
| Philippines                  | 64        | ▼ |
| Armenia                      | 59        | ▼ |
| Tunisia                      | 49        | ▼ |
| Morocco                      | 35        | ▼ |

**Country average vs. International average:**

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

Item Number: S031349

|                          |          |
|--------------------------|----------|
| <b>Correct Response:</b> | <b>A</b> |
|--------------------------|----------|

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