

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 understand complex information. 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.

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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.

1999 Content Domains:

- Earth science
- Life science
- Physics
- Chemistry
- Environmental and resource issues
- Scientific enquiry and the nature of science

2003 Content Domains:

- Chemistry
- Earth science
- Environmental science
- Life science
- Physics

1999 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 *Layers of Earth*, 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 *understanding simple information*. Looking at *Litmus test*, the first item from TIMSS 2003 (page 75), the content domain (*chemistry*) and the cognitive domain (*conceptual understanding*) are also accompanied by the Main Topic (*acids and bases*).

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:

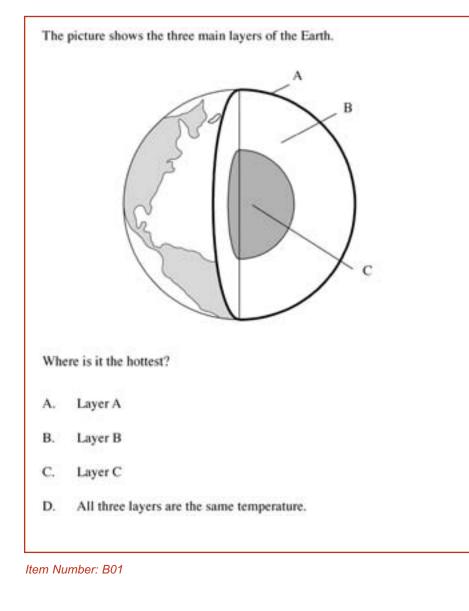
- Letter code. This form is used for the correct response on multiple-choice items. *Layers of Earth* provides an example of the letter code type—the correct answer is C.
- Scoring guide. This form is used to assist in scoring write-in responses. *Life on other planets* (J09) further along in the *Earth Science* domain (page 11), 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 S032057 on page 76.

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	Understanding Simple Information

Layers of Earth



С

Overall Percent Correct

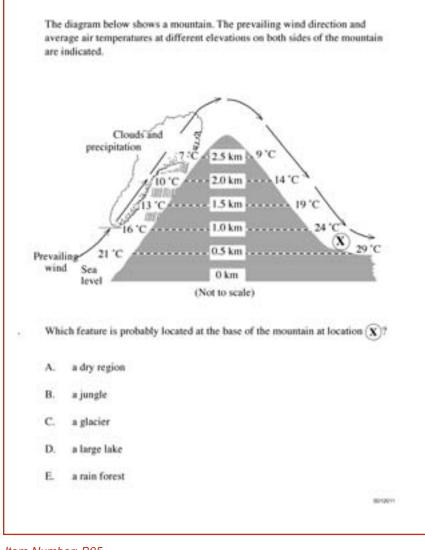
Slovenia	96	
Slovak Republic	95	
Canada	94	
Bulgaria	94	
Netherlands	93	
Finland	93	
England	93	
United States	92	
Hungary	92	
Italy	91	
Czech Republic	91	
Russian Federation	90	
Australia	90	
New Zealand	89	
Japan	89	
Belgium (Flemish)	89	
Hong Kong, SAR	88	
Korea, Rep. of	85	
Chinese Taipei	84	0
Singapore	84	0
Lithuania	83	0
Latvia (LSS)	83	0
Latvia (LSS) International Averag		
International Averag		0
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Country average vs. International average:	
Higher Not different Lower	

Correct Response:

Content Domain	Cognitive Domain
Earth Science	Using Tools, Routine Procedures and Science Processes

Elevation diagram of wind/temperature



Overall Percent Correct

Hungary69ASlovak Republic65ASlovenia62ASlovenia62AIsrael59AIsrael59ALatvia (LSS)59AGanada57AFinland56ABulgaria55ALithuania55AKorea, Rep. of55AOzech Republic55AJapan54ABelgium (Flemish)50OAustralia49OUnited States49OTurkey47OTurkey47OChinese Taipei44OMoldova44OCyprus43OHong Kong, SAR42TPhilippines41TMalaysia37TMalaysia37TIndonesia30TIndonesia30T			
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Tunisia 25 🔻	Jordan England Romania Chinese Taipei Macedonia, Rep. of Moldova Cyprus Hong Kong, SAR Philippines Chile Italy Morocco Malaysia Thailand South Africa Iran, Islamic Rep.	47 44 44 44 43 42 41 41 38 37 37 34 32 31	0 0 0 0 0 0
	Jordan England Romania Chinese Taipei Macedonia, Rep. of Moldova Cyprus Hong Kong, SAR Philippines Chile Italy Morocco Malaysia Thailand South Africa Iran, Islamic Rep. Singapore	47 44 44 43 42 41 41 38 37 37 34 32 31 30	0 0 0 0 0 0
	Jordan England Romania Chinese Taipei Macedonia, Rep. of Moldova Cyprus Hong Kong, SAR Philippines Chile Italy Morocco Malaysia Thailand South Africa Iran, Islamic Rep. Singapore Indonesia	47 44 44 43 42 41 41 38 37 37 34 32 31 30 30	0 0 0 0 0

Country average vs. International average:		
Higher Not different Lower		

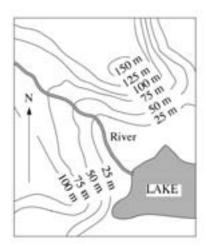
Item Number: B05

Correct Response: A

Content Domain	Cognitive Domain
Earth Science	Using Tools, Routine Procedures and Science Processes

Contour map showing river

On the diagram, hills and valleys are shown by means of contour lines. Each contour line indicates that all points on the line have the same elevation above sea level.



In which direction does the river flow?

- A. Northeast
- B. Southeast
- C. Northwest
- D. Southwest
- E. It is not possible to tell from the map.

Item Number: D03

Correct Response: B

Chinese Taipei 61 Hong Kong, SAR 61 Slovenia 59 Belgium (Flemish) 53 Australia 53 52 Japan 51 Malaysia England 51 Korea, Rep. of 50 Russian Federation 50 Netherlands 49 Finland 48 United States 48 Canada 46 0 Singapore 44 44 Hungary 43 0 Slovak Republic Bulgaria 41 0 New Zealand 41 0 Czech Republic 40 0 Lithuania 38 0 Latvia (LSS) 37 0 International Average 37 32 0 Moldova ▼ Macedonia, Rep. of 28 ▼ Thailand 26 ▼ Turkey 26 ▼ 26 Romania ▼ 25 Israel ▼ 23 Iran, Islamic Rep. ▼ 21 Italy ▼ Cyprus 21 South Africa 21 ▼ Jordan 19 ▼ ▼ Indonesia 18 • Morocco 17 ▼ Philippines 16 ▼ Tunisia 16 • Chile 14

Country average vs. International average:	
Higher	
Not different	0
Lower	▼

Content Domain	Cognitive Domain
Earth Science	Understanding Complex Information

Oxygen equipment on mountain tops

Why do mountain climbers use oxygen equipment at the top of the world's highest mountains?

- A. There is less oxygen in the air at great heights.
- B. There is little nitrogen in the air at great heights.
- C. There is a hole in the ozone layer.
- D. There is no air at the top of very high mountains.

Item Number: F05

Correct Response:

Α

Singapore	95	
Hong Kong, SAR	94	
Chinese Taipei	94	
Korea, Rep. of	93	
Czech Republic	92	
Canada	92	
Netherlands	91	
Slovak Republic	91	
Bulgaria	91	
Malaysia	90	
United States	90	
England	90	
Hungary	90	
Belgium (Flemish)	90	
Australia	90	
Finland	90	
New Zealand	87	
Slovenia	87	
Russian Federation	84	
Israel	80	0
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Lithuania	80	0
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International Average Iran, Islamic Rep.	80 e 79 79	0 0 0 0 0 0
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International Averag Iran, Islamic Rep. Italy Thailand	80 e 79 79 78 76	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of	80 e 79 78 76 75	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile	80 e 79 79 78 76 75 75	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus	80 e 79 78 76 75 75 75 74 70	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus Romania	80 79 78 76 75 75 74 70 70	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus Romania Latvia (LSS) Indonesia	80 79 78 76 75 75 74 70 70 69 67	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus Romania Latvia (LSS) Indonesia Turkey	80 79 78 76 75 75 74 70 70 69 67 65	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus Romania Latvia (LSS) Indonesia Turkey Moldova Jordan	80 79 78 76 75 75 74 70 69 67 65 64 63	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
International Average Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus Romania Latvia (LSS) Indonesia Turkey Moldova Jordan Tunisia	80 79 78 76 75 75 74 70 69 67 65 64 63 56	0 0 0 0 0 0 0 0 0 0 0
International Averag Iran, Islamic Rep. Italy Thailand Macedonia, Rep. of Chile Japan Cyprus Romania Latvia (LSS) Indonesia Turkey Moldova Jordan Tunisia Philippines	80 79 78 76 75 75 74 70 70 69 67 65 64 63 56 48	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Country average vs. International average:		
Higher Not different Lower		

Content Domain	Cognitive Domain
Earth Science	Understanding Simple Information

Why moon shines

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 very high speed.
- C. The Moon is covered with a thin layer of ice.
- D. The Moon has many craters.

Item Number: H03

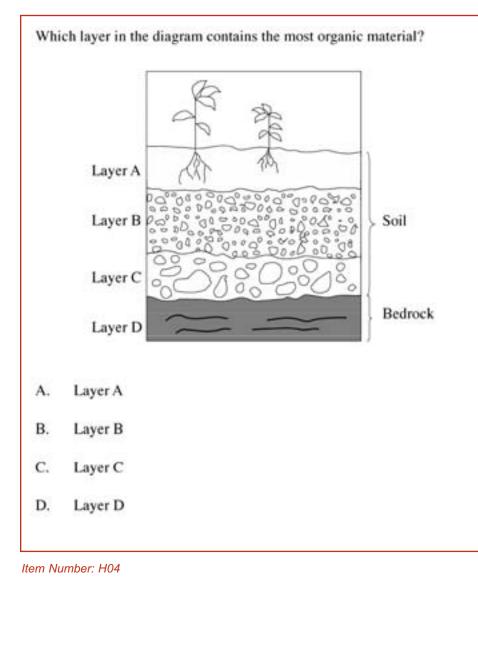
Correct Response:	Α
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Hong Kong, SAR	96	
Singapore	95	
Chinese Taipei	95	
Bulgaria	93	
Netherlands	91	
Japan	89	
England	88	
Malaysia	87	
Canada	87	
Belgium (Flemish)	86	
United States	86	
Finland	86	
Hungary	86	
Czech Republic	86	
New Zealand	84	0
Cyprus	84	0
Turkey	84	0
Australia	83	0
Latvia (LSS)	83	0
Slovak Republic	83	0
Jordan	83	0
Iran, Islamic Rep.	82	0
International Average	81	
Russian Federation	81	0
Korea, Rep. of	80	0
Macedonia, Rep. of	80	0
Slovenia	79	0
Thailand	78	0
Romania	78	0
Indonesia	76	▼
Italy	75	•
Moldova	75	•
Philippines	73	▼
Israel	72	•
Lithuania	72	•
Tunisia	71	* * * * * *
Morocco	64	▼
Chile	64	▼
South Africa	57	•

Country average vs. International average:		
Higher Not different	0	
Lower	•	

Content Domain	Cognitive Domain
Earth Science	Understanding Complex Information

Diagram of soil layers



Overall Percent Correct

Macedonia, Rep. of	76	
Russian Federation	76	
Slovenia	75	
Czech Republic	71	
Lithuania	67	
Romania	63	
Belgium (Flemish)	63	
Hungary	60	
Latvia (LSS)	59	
Slovak Republic	57	
Italy	53	0
Netherlands	53	0
Korea, Rep. of	53	
Moldova	51	0
Australia	50	0
Japan	50	0
Canada	50	0
Bulgaria	50	0
Thailand	49	0
England	48	0
International Average	e 48	
Finland	e 48 48	0
Finland Cyprus	48 47	0
Finland Cyprus Chile	48	0
Finland Cyprus Chile New Zealand	48 47 47 46	0 0 0
Finland Cyprus Chile New Zealand Philippines	48 47 47 46 44	0 0 0 0
Finland Cyprus Chile New Zealand Philippines Singapore	48 47 47 46 44 43	0 0 0 0
Finland Cyprus Chile New Zealand Philippines Singapore Tunisia	48 47 47 46 44 43 42	0 0 0 0
Finland Cyprus Chile New Zealand Philippines Singapore Tunisia Indonesia	48 47 46 44 43 42 41	0 0 0 0
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Finland Cyprus Chile New Zealand Philippines Singapore Tunisia Indonesia United States Morocco	48 47 46 44 43 42 41 40 36	0 0 0 0
Finland Cyprus Chile New Zealand Philippines Singapore Tunisia Indonesia United States Morocco South Africa	48 47 46 44 43 42 41 40 36 35	0 0 0 0
Finland Cyprus Chile New Zealand Philippines Singapore Tunisia Indonesia United States Morocco South Africa Iran, Islamic Rep.	48 47 46 44 43 42 41 40 36 35 34	0 0 0 0
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Finland Cyprus Chile New Zealand Philippines Singapore Tunisia Indonesia United States Morocco South Africa Iran, Islamic Rep. Jordan Turkey Chinese Taipei Israel Malaysia	48 47 46 44 43 42 41 40 36 35 34 32 29 28 28 28 28 22	0 0 0 0

Country average vs. International average:		
Higher Not different Lower		

Correct Response:

Α

8

Content Domain	Cognitive Domain
Earth Science	Understanding Simple Information

Earth's plates over millions of years

Which BEST describes the movement of the plates that make up Earth's surface over millions of years?

- A. They moved for millions of years but have now stopped.
- B. They stayed the same for millions of years but are now moving.
- C. They have been continually moving.
- D. They have never moved.

Item Number: J01

Correct Response: C

Hungary	93	
Canada	91	
Australia	89	
Slovak Republic	89	
Singapore	89	
Chinese Taipei	87	
Czech Republic	87	
England	86	
Hong Kong, SAR	85	
United States	84	
Korea, Rep. of	83	
Slovenia	82	
Finland	82	0
Netherlands	81	0
New Zealand	81	0
Belgium (Flemish)	81	0
Bulgaria	81	0
Latvia (LSS)	80	0
Lithuania	80	0
Russian Federation	80	0
Moldova	80	0
Japan	79	
Italy	77	0
Romania	75	0
Thailand	75	0
International Average	e 75	
Chile	73	0
Israel	73	0
Malaysia	68	•
Cyprus	68	0
Macedonia, Rep. of	67	•
Turkey	65	▼
Iran, Islamic Rep.	61	▼
Indonesia	60	▼
Jordan	56	•
Philippines	55	▼
Tunisia	52	
South Africa	32	▼
Morocco	29	▼

Country average vs. International average:		
Higher		
Not different	0	
Lower	▼	

Content Domain	Cognitive Domain
Earth Science	Understanding Complex Information

Factor explaining seasons on Earth

Which of the following is an important factor in explaining why seasons occur on Earth?

- A. Earth rotates on its axis.
- B. The Sun rotates on its axis.
- C. Earth's axis is tilted.
- D. The Sun's axis is tilted.

Item Number: J06

Correct Response: C

Japan	52	
Hong Kong, SAR	48	
England	44	
Italy	44	
Australia	41	
Chinese Taipei	40	
Canada	38	
New Zealand	38	
United States	37	
Finland	34	0
Bulgaria	34	0
Korea, Rep. of	30	0
Slovak Republic	30	0
Russian Federation	30	0
Slovenia	29	0
Czech Republic	28	0
Israel	28	0
Netherlands	27	0
International Averag	e 26	
Lithuania	26	0
Littiuailla	20	0
Malaysia	26 25	0
Malaysia	25	0 0 0
Malaysia Cyprus	25 24	0 0 0 0
Malaysia Cyprus Hungary	25 24 23	0 0 0
Malaysia Cyprus Hungary Belgium (Flemish)	25 24 23 22	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova	25 24 23 22 22	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand	25 24 23 22 22 21	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey	25 24 23 22 22 21 18	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore	25 24 23 22 22 21 18 18	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco	25 24 23 22 21 18 18 18	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan	25 24 23 22 21 18 18 18 18 18	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania	25 24 23 22 21 18 18 18 18 17 17	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania South Africa	25 24 23 22 21 18 18 18 18 17 17	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania South Africa Chile	25 24 23 22 21 18 18 18 17 17 15 15	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania South Africa Chile Iran, Islamic Rep.	25 24 23 22 21 18 18 18 17 17 15 15 13	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania South Africa Chile Iran, Islamic Rep. Latvia (LSS)	25 24 23 22 21 18 18 18 17 17 15 15 13 13	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania South Africa Chile Iran, Islamic Rep. Latvia (LSS) Tunisia	25 24 23 22 21 18 18 18 17 17 15 15 13 13 13	0 0 0 0
Malaysia Cyprus Hungary Belgium (Flemish) Moldova Thailand Turkey Singapore Morocco Jordan Romania South Africa Chile Iran, Islamic Rep. Latvia (LSS) Tunisia Philippines	25 24 23 22 21 18 18 18 17 15 15 13 13 13 13 13	0 0 0 0

Country average vs. International average:		
Higher Not different Lower	0	

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

Life on other planets

Diana and Mario were discussing what it might be like on other planets. Their science teacher gave them data about Earth and an imaginary planet Proto. The table shows these data.

	Earth	Proto
Distance from a star like the Sun	148 640 000 km	902 546 000 km
Atmospheric pressure at surface of planet	101-325 Pa	100 Pa
Atmospheric conditions • gas components	21% oxygen 0.03% carbon dioxide 78% nitrogen	5% oxygen 5% carbon dioxide 90% nitrogen
ozone layer	yes	no
cloud cover	yes	во

Write down one important reason why it would be difficult for humans to live on Proto if it existed. Explain your answer.

Item Number: J09

SCORING

Note: A correct response must clearly indicate the reason why a condition listed in the table makes it hard for humans to live on Proto. Responses referencing insufficient (too little, less, not enough, etc.) oxygen with or without explicitly mentioning breathing will be given credit due to the assumption of common knowledge. If more than one reason is given, assign credit corresponding to the first correct reason.

Correct Response

- States that there would be insufficient (too little, less, not enough, etc.) oxygen (to breath).
- States that the atmospheric pressure would be too low with an explanation based on low air/oxygen levels or effects of lower boiling point, etc.
- States that there is no ozone layer to protect people (against star's UV radiation).
- · States that no cloud cover means no (low) water.
- States that it is too cold (due to distance from the star).
- Other correct.

Incorrect Response

- Merely repeats information in table and/or stem with no explanation.
- States that it is too hot due to no ozone layer.
- States that there is little (no) gravity (confuses atmospheric pressure with gravity).
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Slovak Republic	89	
Singapore	86	
Australia	83	
Hungary	83	
Canada	82	
England	82	
Netherlands	81	
Latvia (LSS)	80	
New Zealand	80	
Finland	80	
Chinese Taipei	79	
Slovenia	78	
United States	78	
Belgium (Flemish)	77	
Korea, Rep. of	77	
Czech Republic	75	0
Russian Federation	73	
Italy	70	0
Hong Kong, SAR	70	0
Japan	69	0
Lithuania	67	0
Malaysia	67	0
International Average	e 66	
Bulgaria	65	0
Tunisia	64	0
Thailand	62	0
Israel	62	0
Jordan	59	0
Indonesia	59	0
Macedonia, Rep. of	58	0
Chile	57	
Cyprus	51	
Moldova	51	
Romania	48	
Turkey	47	
Iran, Islamic Rep.	45	
Philippines	26	
Morocco	25	* * * * * *
South Africa	21	

Country average vs. International average:		

Content Domain	Cognitive Domain
Earth Science	Understanding Complex Information

Atmospheric conditions in jets

Jet aircraft typically fly at altitudes of approximately 10,000 meters. Atmospheric conditions at this altitude are different from those at ground level. Write down one difference that exists and explain why it must be controlled for in order for people to survive inside jet aircraft.

Item Number: R04

SCORING

Note: A correct response must include an explanation identifying an atmospheric condition that is different at high altitudes and why it must be controlled for. Responses referencing low oxygen level (too little, less, not enough) with or without explicitly mentioning breathing will be given credit due to the assumption of prior knowledge.

Correct Response

- Refers to controlling for low oxygen level and/or little air ("thin atmosphere") in order to breath.
- Refers to controlling for low atmospheric pressure with explanation relating to the effect on humans.
- Refers to controlling for low atmospheric temperature.
- Other correct.

Incorrect Response

- Mentions pressure, temperature or oxygen with incorrect or no further explanation.
- · Mentions gravity.
- · Refers only to effects of wind, air currents, or turbulence, etc.
- · Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Slovak Republic	65	
Chinese Taipei	55	
Belgium (Flemish)	51	
Canada	50	
Australia	49	
Thailand	47	
Russian Federation	46	
Singapore	46	
Korea, Rep. of	45	
Lithuania	45	
New Zealand	45	
England	44	
Finland	42	0
Bulgaria	40	0
Latvia (LSS)	38	0
Slovenia	38	0
Hong Kong, SAR	35	0
Indonesia	35	0
Italy	34	0
International Average	e 33	
International Average	e	
Hungary	33	0
		0
Hungary	33	
Hungary Israel	33 32	0 0 0
Hungary Israel Moldova	33 32 31	0 0 0
Hungary Israel Moldova Czech Republic	33 32 31 29	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of	33 32 31 29 28	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan	33 32 31 29 28 28 28 27 25	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania	33 32 31 29 28 28 28 27	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey	33 32 31 29 28 28 28 27 25	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands	33 32 31 29 28 28 28 27 25 24	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia	 33 32 31 29 28 28 27 25 24 23 23 21 	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep.	 33 32 31 29 28 28 27 25 24 23 23 	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep. Cyprus	 33 32 31 29 28 28 27 25 24 23 23 21 	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep. Cyprus Tunisia United States Jordan	 33 32 31 29 28 27 25 24 23 23 21 17 	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep. Cyprus Tunisia United States	 33 32 31 29 28 27 25 24 23 23 21 17 17 	0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep. Cyprus Tunisia United States Jordan Chile Philippines	 33 32 31 29 28 27 25 24 23 23 21 17 17 17 	0 0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep. Cyprus Tunisia United States Jordan Chile	 33 32 31 29 28 27 25 24 23 21 17 17 10 6 5 	0 0 0 0 0
Hungary Israel Moldova Czech Republic Macedonia, Rep. of Japan Romania Turkey Netherlands Malaysia Iran, Islamic Rep. Cyprus Tunisia United States Jordan Chile Philippines	 33 32 31 29 28 27 25 24 23 23 21 17 17 17 10 6 	0 0 0 0

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

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

Diagram of rain from sea

Draw a diagram to show how water from the sea can fall as rain on land.

Item Number: Z02

SCORING

Note: A fully correct response must show clear evidence of the following 4 steps:

- (i) Evaporation of water from the sea
- (ii) Condensation (as clouds)
- (iii) Transportation (from sea to land)
- (iv) Precipitation.

The steps do not have to be indicated on a labeled diagram for full credit, but the drawing and/or accompanying explanatory text must be clear with respect to the direction of water flow. Steps (ii) and (iii) may be clearly indicated as two steps (e.g. formation of clouds and transportation by wind) or as a single step showing a series of clouds extending over land and sea.

Correct Response

- •Response includes a diagram indicating all 4 steps (i, ii, iii and iv above) and direction of water flow.
- •No diagram is shown, but response includes a complete and correct textual description of the water cycle.

•Other fully correct.

Partial Response

- · As in correct response but evaporation is unclear or omitted.
- As in correct response but condensation is unclear or omitted.
- · As in correct response but transportation is unclear or omitted.
- · As in correct response but precipitation is unclear or omitted.
- Other partially correct.

Incorrect Response

- · Response clearly indicates evaporation and/or condensation only.
- Response clearly indicates precipitation only (may also show clouds).
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Belgium (Flemish)	77	
Singapore	76	
England	74	
Hungary	67	
Malaysia	66	
Australia	66	
Netherlands	65	
Russian Federation	64	
New Zealand	60	
Canada	58	
Slovenia	56	
Japan	54	
Finland	52	
Czech Republic	47	0
Korea, Rep. of	43	0
Chinese Taipei	43	0
Italy	42	0
Thailand	41	0
Jordan	41	0
Latvia (LSS)	41	0
International Average	40	
Cyprus	35	0
-) - : : : -	55	0
Slovak Republic	35	
Slovak Republic Chile Romania	35	
Slovak Republic Chile	35 27 26 26	
Slovak Republic Chile Romania	35 27 26 26 25	
Slovak Republic Chile Romania Macedonia, Rep. of	35 27 26 26 25 25	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia	35 27 26 26 25	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey	35 27 26 26 25 25	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania	35 27 26 26 25 25 20	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines	35 27 26 26 25 25 20 19	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia	35 27 26 25 25 20 19 17	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia Moldova	35 27 26 25 25 20 19 17 14	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia Moldova Israel	35 27 26 25 25 20 19 17 14 14	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia Moldova Israel United States South Africa Bulgaria	35 27 26 25 25 20 19 17 14 14 13	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia Moldova Israel United States South Africa	35 27 26 25 25 20 19 17 14 14 13 11	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia Moldova Israel United States South Africa Bulgaria	35 27 26 25 25 20 19 17 14 14 13 11	
Slovak Republic Chile Romania Macedonia, Rep. of Tunisia Turkey Lithuania Philippines Indonesia Moldova Israel United States South Africa Bulgaria Iran, Islamic Rep.	35 27 26 25 25 20 19 17 14 14 13 11 11 10	

Country average vs.		
International av	erage:	
Higher		
Not different	0	
Lower		

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

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?

- A. no change in pulse but a decrease in breathing rate
- B. an increase in pulse but no change in breathing rate
- C. an increase in pulse and breathing rate
- D. a decrease in pulse and breathing rate
- E. no change in either

Item Number: B04

Overall Percent Correct

Japan	98	
Hungary	97	
Singapore	96	
Netherlands	95	
Belgium (Flemish)	95	
England	95	
Slovenia	95	
Korea, Rep. of	95	
Lithuania	95	
Canada	94	
Chinese Taipei	94	
Finland	94	
Czech Republic	94	
Australia	94	
Hong Kong, SAR	93	
Tunisia	92	
Slovak Republic	92	
Bulgaria	92	
Latvia (LSS)	92	
United States	91	
New Zealand	90	
Malaysia	89	0
Russian Federation	89	0
Italy	89	0
Cyprus	88	0
International Average	e 87	
Thailand	87	0
Israel	86	0
Macedonia, Rep. of	86	0
Moldova	85	0
Romania	84	0
Chile	83	▼
Indonesia	83	▼
Jordan	83	▼
Turkey	79	▼
Iran, Islamic Rep.	79	▼
Philippines	59	0 • • • •
Morocco	58	▼
South Africa	36	▼

Country avera International av	•
Higher	▲
Not different	○
Lower	▼

Correct Response:

С

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Sensory messages to the brain

Sensory messages are taken to the brain by
A. arteries and veins
B. arteries and hormones
C. nerves and hormones
D. muscles and veins
Item Number: D05
Nom Humbon Boo

С

Overall Percent Correct

Czech Republic	89	
Netherlands	83	
Bulgaria	82	
Thailand	82	
Latvia (LSS)	82	
Korea, Rep. of	80	
Lithuania	80	
Belgium (Flemish)	79	
Slovenia	78	
Slovak Republic	78	
Russian Federation	78	
Hungary	78	
Tunisia	76	
Japan	75	
Iran, Islamic Rep.	74	
England	74	
Chinese Taipei	72	0
Moldova	72	0
Finland	71	0
Australia	71	0
Macedonia, Rep. of	71	0
United States	71	0
Israel	70	0
International Average	e 69	
Singapore	68	0
Canada	68	0
Hong Kong, SAR	67	0
Indonesia	66	0
Italy	64	0
Jordan	64	0
Romania	64	0
New Zealand	61	
Malaysia	60	
Cyprus	53	
Turkey	53	
Philippines	45	* * * * *
Morocco	42	
South Africa	36	
Chile	35	
Country overero ve		

Country average vs. International average:		
Higher Not different Lower		

Correct Response:

15

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Seed development from plant part

Seeds develop from which part of a plant? A. Flower B. Leaf C. Root D. Stem		
B. Leaf C. Root D. Stem	Seeds develop from which part of a plant?	
C. Root D. Stem	A. Flower	
D. Stem	B. Leaf	
	C. Root	
tem Number: D06	D. Stem	
tem Number: D06		
rem Number: D06		
em Number: D06		
em Number: D06		
em Number: D06		
em Number: D06		
em Number: D06		
em Number: D06		
tem Number: D06		
tem Number: D06		
	tem Number: D06	

Α

Overall Percent Correct

Czech Republic Slovak Republic	94 93	
Latvia (LSS)	92	
Lithuania	89	
Hungary	87	
Russian Federation	86	
Romania	85	
Slovenia	84	
Japan	83	
Moldova	82	
Italy	82	
Singapore	82	
Finland	82	
Belgium (Flemish)	80	
Macedonia, Rep. of	80	
Indonesia	80	
Bulgaria	78	
Korea, Rep. of	77	
Netherlands	72	0
International Average	71	
Hong Kong, SAR	69	0
Thailand	69	0
Thailand Australia	69 68	0
Thailand Australia Iran, Islamic Rep.	69 68 68	0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia	69 68 68 67	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan	69 68 68 67 67	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand	69 68 68 67 67 65	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan	69 68 67 67 65 65	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England	69 68 67 67 65 65 63	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia	69 68 67 67 65 65	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada	69 68 67 67 65 65 63 63 63	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei	69 68 67 67 65 65 63 63 61 57	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile Cyprus	69 68 67 67 65 65 63 63 61 57 57	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile	69 68 67 67 65 65 63 63 61 57	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile Cyprus	69 68 67 67 65 65 63 63 61 57 57 57 57	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile Cyprus United States Turkey Israel	69 68 67 67 65 65 63 63 61 57 57 57	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile Cyprus United States Turkey Israel Philippines	69 68 67 67 65 63 63 63 61 57 57 57 57 52 39	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile Cyprus United States Turkey Israel	69 68 67 67 65 63 63 63 61 57 57 57 56 52	0 0 0 0
Thailand Australia Iran, Islamic Rep. Malaysia Jordan New Zealand Tunisia England Chinese Taipei Canada Chile Cyprus United States Turkey Israel Philippines	69 68 67 67 65 63 63 63 61 57 57 57 57 52 39	0 0 0

Country average vs. International average:		
Higher Not different Lower		

Correct Response:

16

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Characteristic of mammal

A small animal called the duckbilled platypus lives in Australia. Which characteristic of this animal shows that it is a mammal?

- A. It eats other animals.
- B. It feeds its young milk.
- C. It makes a nest and lays eggs.
- D. It has webbed feet.

Item Number: F01

Correct Response: B

Slovenia	89	
Japan	86	
Bulgaria	85	
Iran, Islamic Rep.	84	
Hong Kong, SAR	83	
Slovak Republic	81	
Chinese Taipei	80	
Latvia (LSS)	80	
Cyprus	80	
Czech Republic	79	
Malaysia	78	
Hungary	78	
Korea, Rep. of	77	
Singapore	77	
Russian Federation	76	0
Romania	73	0
Thailand	71	0
Finland	71	0
Belgium (Flemish)	70	0
Lithuania	70	0
Littiualiia	70	0
Macedonia, Rep. of	70	0
	70	
Macedonia, Rep. of	70	0
Macedonia, Rep. of International Average	70 70	0
Macedonia, Rep. of International Average Italy	70 70 70 70	0 0 0 0
Macedonia, Rep. of International Average Italy Chile	70 70 70 68	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova	70 70 68 68 67 66	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia	70 70 70 68 68 68 67	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada	70 70 68 68 67 66	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey	70 70 70 68 68 68 67 66 65	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States	70 70 68 68 67 66 65 65	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia	70 70 68 68 67 66 65 65 64	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan	70 70 68 68 67 66 65 65 64 63	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan Australia Netherlands Israel	70 70 68 68 67 66 65 65 64 63 63	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan Australia Netherlands	70 70 68 68 67 66 65 65 65 64 63 63 63 62	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan Australia Netherlands Israel	70 70 68 68 67 66 65 65 65 64 63 63 62 60	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan Australia Netherlands Israel New Zealand	70 70 68 67 66 65 65 64 63 63 63 62 60 54 52 46	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan Australia Netherlands Israel New Zealand England South Africa Morocco	70 70 68 67 66 65 65 65 64 63 63 63 62 60 54 52 46 45	0 0 0 0
Macedonia, Rep. of International Average Italy Chile Moldova Tunisia Canada Turkey United States Indonesia Jordan Australia Netherlands Israel New Zealand England South Africa	70 70 68 67 66 65 65 64 63 63 63 62 60 54 52 46	0

Country average International av	-
Higher Not different	▲ ○
Lower	V

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Interpretation of senses

Humans interpret seeing, hearing, tasting and smelling in the

A. brain

B. spinal cord

C. receptors

D. skin

Item Number: F03

Correct Response: A

Bulgaria	91	
Hong Kong, SAR	91	
Singapore	86	
Malaysia	85	
United States	85	
Netherlands	83	
Russian Federation	82	
England	81	
New Zealand	81	
Canada	81	
Chinese Taipei	80	
Moldova	78	
Turkey	78	
Hungary	76	
Australia	72	
Finland	69	0
Lithuania	67	0
Czech Republic	67	0
International Average	e 65	
Chile	65	0
		0 0
Chile	65	0
Chile Latvia (LSS)	65 65	0
Chile Latvia (LSS) Macedonia, Rep. of	65 65 65	0
Chile Latvia (LSS) Macedonia, Rep. of Romania	65 65 65 63	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia	65 65 63 61	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel	65 65 63 61 60	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines	65 65 63 61 60 58	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan	65 65 63 61 60 58 58	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of	65 65 63 61 60 58 58 55	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan	65 65 63 61 60 58 58 55 54	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan Iran, Islamic Rep.	65 65 63 61 60 58 58 55 54 50	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan Iran, Islamic Rep. Italy	65 65 63 61 60 58 58 55 54 50 44	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan Iran, Islamic Rep. Italy Slovenia	65 65 63 61 60 58 58 55 54 50 44 43	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan Iran, Islamic Rep. Italy Slovenia Morocco	65 65 63 61 60 58 58 55 54 50 44 43 43	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan Iran, Islamic Rep. Italy Slovenia Morocco Belgium (Flemish)	65 65 63 61 60 58 58 55 54 50 44 43 43 40	0
Chile Latvia (LSS) Macedonia, Rep. of Romania Indonesia Israel Philippines Jordan Korea, Rep. of Japan Iran, Islamic Rep. Italy Slovenia Morocco Belgium (Flemish) South Africa	65 65 63 61 60 58 55 54 50 44 43 43 40 32	0

Country avera International av	•
Higher	
Not different	0
Lower	•

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

NOT a function of blood

Which of these is NOT a function of the blood?	Which of these	is NOT a	function	of the blood?
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- A. Digesting food
- B. Protecting against disease
- C. Carrying waste materials away from the cells
- D. Carrying oxygen to different parts of the body

Item Number: H01

Correct Response:

Α

Thailand	90	
Chinese Taipei	88	
Czech Republic	88	
Hungary	85	
Japan	84	
United States	83	
Canada	81	
England	81	
Slovak Republic	81	
Finland	80	
Australia	80	
Bulgaria	79	
Netherlands	79	
Korea, Rep. of	77	
Belgium (Flemish)	77	
Italy	77	
Hong Kong, SAR	76	
Russian Federation	75	0
Singapore	74	0
Slovenia	73	0
New Zealand	72	0
New Zealand International Average		0
		0
International Average	e 70	
International Average	70 69	0 0 0
International Average Lithuania Chile	e 70 69 69	0 0 0 0
International Average Lithuania Chile Romania	e 70 69 69 66	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of	 70 69 69 66 65 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel	 70 69 69 66 65 64 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan	 70 69 69 66 65 64 63 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS)	 70 69 69 66 65 64 63 58 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia	 70 69 69 66 65 64 63 58 57 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep.	 70 69 69 66 65 64 63 58 57 56 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova	 70 69 69 65 64 63 58 57 56 56 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova Indonesia	 70 69 69 66 65 64 63 58 57 56 56 53 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova Indonesia Turkey	 70 69 69 66 65 64 63 58 57 56 53 51 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova Indonesia Turkey Philippines	 70 69 69 66 65 64 63 58 57 56 53 51 50 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova Indonesia Turkey Philippines Tunisia	 70 69 69 66 65 64 63 58 57 56 56 53 51 50 44 	0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova Indonesia Turkey Philippines Tunisia Morocco	 70 69 69 66 65 64 63 58 57 56 56 53 51 50 44 43 	0 0 0 0
International Average Lithuania Chile Romania Macedonia, Rep. of Israel Jordan Latvia (LSS) Malaysia Iran, Islamic Rep. Moldova Indonesia Turkey Philippines Tunisia Morocco	 70 69 69 66 65 64 63 58 57 56 56 53 51 50 44 43 	0 0 0 0

Country avera International av	•
Higher	
Not different	0
Lower	•

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Role of vitamins

What are vitamins?

- A. Substances that break down food
- B. Bacteria that people get when they eat some foods
- C. Substances that people make from protein
- D. Substances that people need in small amounts in order for their bodies to function normally

Item Number: H02

Correct Response: D

Latvia (LSS)	95	
Russian Federation	95	
Hungary	95	
Netherlands	93	
Korea, Rep. of	92	
Slovenia	90	
Slovak Republic	89	
Finland	88	
Bulgaria	87	
Belgium (Flemish)	87	
Malaysia	86	
Lithuania	86	
Czech Republic	84	
Indonesia	84	
England	83	
Italy	83	
Australia	83	
Canada	82	0
Singapore	80	0
T 1 1	70	0
Thailand	79	0
Chile	79	0
	79	
Chile International Average United States	79	
Chile International Average	79 78	0
Chile International Average United States	79 78 78	0 0 0 0 0 0 0
Chile International Average United States New Zealand	79 78 78 78 76	0 0 0 0 0 0 0 0 0 0
Chile International Average United States New Zealand Israel	79 78 78 76 75	0 0 0 0 0
Chile International Average United States New Zealand Israel Romania	79 78 78 76 75 74	0 0 0 0 0
Chile International Average United States New Zealand Israel Romania Jordan	79 78 78 76 75 74 73	0 0 0 0 0
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of	79 78 78 76 75 74 73 71	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova	79 78 78 76 75 74 73 71 71	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei	79 78 78 76 75 74 73 71 71 71	0 0 0 0 0
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep.	79 78 78 76 75 74 73 71 71 71 71 70	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep. Turkey	79 78 78 76 75 74 73 71 71 71 71 70 69	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep. Turkey Hong Kong, SAR	79 78 78 76 75 74 73 71 71 71 71 70 69 69	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep. Turkey Hong Kong, SAR Cyprus	79 78 78 76 75 74 73 71 71 71 71 70 69 69 68	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep. Turkey Hong Kong, SAR Cyprus Philippines	79 78 78 76 75 74 73 71 71 71 71 71 70 69 69 68 68 68	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep. Turkey Hong Kong, SAR Cyprus Philippines Japan	79 78 78 76 75 74 73 71 71 71 71 71 70 69 69 68 68 68 65	
Chile International Average United States New Zealand Israel Romania Jordan Macedonia, Rep. of Moldova Chinese Taipei Iran, Islamic Rep. Turkey Hong Kong, SAR Cyprus Philippines Japan Morocco	79 78 76 75 74 73 71 71 70 69 68 65 59	

Country avera International av	-
Higher Not different Lower	

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Feature shared by all insects

- A. External skeleton
- B. Two pairs of wings
- C. Jumping legs
- D. Stinging mechanism

Item Number: J02

Correct Response:

Α

Canada	81	
United States	78	
England	78	
New Zealand	76	
Netherlands	75	
Australia	74	
Japan	72	
Hungary	66	
Singapore	62	
Turkey	58	
Latvia (LSS)	58	0
Chinese Taipei	57	
Finland	55	0
Korea, Rep. of	54	0
Italy	53	0
Hong Kong, SAR	51	0
Russian Federation	50	0
Israel	50	0
International Average	e 49	
Slovenia	49	0
	1.5	-
Belgium (Flemish)	46	0
Belgium (Flemish)	46	0
Belgium (Flemish) Bulgaria	46 45	0 0 0
Belgium (Flemish) Bulgaria Malaysia	46 45 45	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic	46 45 45 43	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa	46 45 45 43 41	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia	46 45 45 43 41 39	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania	46 45 43 41 39 37	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus	46 45 43 41 39 37 36	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of	46 45 43 41 39 37 36 36	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand	46 45 43 41 39 37 36 36 36	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova	46 45 43 41 39 37 36 36 36 36 36	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova Lithuania	46 45 43 41 39 37 36 36 36 36 36 32	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova Lithuania Philippines Chile Jordan	46 45 43 41 39 37 36 36 36 36 32 32	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova Lithuania Philippines Chile	46 45 43 41 39 37 36 36 36 36 36 32 32 32 32	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova Lithuania Philippines Chile Jordan	46 45 43 41 39 37 36 36 36 36 36 32 32 32 32 29	0 0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova Lithuania Philippines Chile Jordan Slovak Republic	46 45 43 41 39 37 36 36 36 36 32 32 32 29 29	0 0
Belgium (Flemish) Bulgaria Malaysia Czech Republic South Africa Indonesia Romania Cyprus Macedonia, Rep. of Thailand Moldova Lithuania Philippines Chile Jordan Slovak Republic Iran, Islamic Rep.	46 45 43 41 39 37 36 36 36 36 32 32 32 29 29 25	0 0 0

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

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Reason for protein in diet

The BEST reason for including protein in a healthy diet is because it is the main source of

- A. energy for the body
- B. fiber for digestion
- C. raw materials for cell growth and repair
- D. vitamins for fighting disease

Item Number: J07

Correct Response:

С

Chinese Taipei	62	
Finland	61	
Malaysia	60	
Belgium (Flemish)	54	
Hong Kong, SAR	53	
Slovenia	53	
Thailand	50	
Indonesia	49	
Czech Republic	47	
Singapore	45	
Hungary	44	
Slovak Republic	42	
Korea, Rep. of	41	
Russian Federation	38	0
Italy	36	0
Iran, Islamic Rep.	36	0
Cyprus	34	0
International Average	33	
England	33	0
Latvia (LSS)	29	0
	20	
Japan	29	0
		0 0
Japan	29	0 0 0
Japan Australia	29 27	0 0 0
Japan Australia Jordan	29 27 27	0 0 0
Japan Australia Jordan Bulgaria	29 27 27 26	0 0 0
Japan Australia Jordan Bulgaria Israel	29 27 27 26 24	0 0 0
Japan Australia Jordan Bulgaria Israel Chile	29 27 27 26 24 24	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco	29 27 26 24 24 23	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania	29 27 26 24 24 23 22	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia	29 27 26 24 24 23 22 22 22 22 22	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands	29 27 26 24 24 23 22 22 22	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand Moldova	29 27 26 24 24 23 22 22 22 22 22	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand	29 27 26 24 23 22 22 22 22 22 22 21	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand Moldova	29 27 26 24 23 22 22 22 22 22 21 20	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand Moldova United States	29 27 26 24 23 22 22 22 22 22 21 20 20	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand Moldova United States Turkey Romania Philippines	29 27 26 24 23 22 22 22 22 21 20 20 20 20	0 0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand Moldova United States Turkey Romania Philippines Macedonia, Rep. of	29 27 26 24 23 22 22 22 22 21 20 20 20 20 16	0 0
Japan Australia Jordan Bulgaria Israel Chile Morocco Lithuania Tunisia Netherlands Canada New Zealand Moldova United States Turkey Romania Philippines	29 27 26 24 23 22 22 22 22 21 20 20 20 16 16	0 0 0

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

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Large leaves on seedlings

What is the primary function of the large leaves found on seedlings growing in a forest?

- A. To provide shade for the root systems
- B. To get rid of excess water that is entering through the roots
- C. To allow for leaf damage by insects
- D. To gather as much light as possible for photosynthesis

Item Number: L02

Correct Response:

D

Thailand	92	
Japan	89	
Korea, Rep. of	88	
Slovenia	84	
Hong Kong, SAR	83	
Finland	82	
Italy	82	
Singapore	81	
Hungary	80	
Slovak Republic	80	0
Lithuania	79	0
England	79	0
Russian Federation	79	
Malaysia	78	
Czech Republic	77	0
Turkey	73	0
Canada	73	0
Romania	73	0
Bulgaria	73	0
Cyprus	73	0
-) - · - · -		0
International Average		Ű
		0
International Average	e 72	
International Average Chinese Taipei	e 72 71	0
International Average Chinese Taipei Netherlands	e 72 71 70	0
International Average Chinese Taipei Netherlands Chile	e 72 71 70 69	0 0 0
International Average Chinese Taipei Netherlands Chile Belgium (Flemish)	e 72 71 70 69 69	0 0 0 0
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan	e 72 71 70 69 69 68	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia	e 72 71 70 69 69 68 68	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of	e 72 71 70 69 69 68 68 68 68	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep.	e 72 71 70 69 69 68 68 68 68 67 66	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel	e 72 71 70 69 69 68 68 68 68 67 66 66	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS)	e 72 71 70 69 69 68 68 68 67 66 66 65	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS) Tunisia	e 72 71 70 69 69 68 68 68 67 66 66 65 65	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS) Tunisia United States	e 72 71 70 69 69 68 68 68 67 66 65 65 65 63	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS) Tunisia United States Moldova	e 72 71 70 69 69 68 68 67 66 65 65 65 63 63 63	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS) Tunisia United States Moldova New Zealand	e 72 71 70 69 69 68 68 67 66 65 65 65 63 63 63 62	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS) Tunisia United States Moldova New Zealand Indonesia	e 72 71 70 69 69 68 68 67 66 65 65 65 63 63 62 62 62	
International Average Chinese Taipei Netherlands Chile Belgium (Flemish) Jordan Australia Macedonia, Rep. of Iran, Islamic Rep. Israel Latvia (LSS) Tunisia United States Moldova New Zealand Indonesia Philippines	e 72 71 70 69 68 68 67 66 65 65 65 63 63 63 62 62 55	

Country average vs. International average:		
Higher Not different Lower		

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Physical characteristic of prey

Which one of the following characteristics is most likely to be found in mammals that are preyed on by other mammals for food?

- A. Eyes on the sides of the head
- B. Teeth that are long and pointed
- C. Claws on the feet
- D. Ears that cannot move

Item Number: L03

Overall Percent Correct

Belgium (Flemish)	64	
Japan	61	
Korea, Rep. of	55	
England	54	
New Zealand	50	
Netherlands	50	
Finland	48	
Malaysia	46	
Chinese Taipei	46	
Australia	45	
United States	43	Ο
Canada	42	0
Slovenia	40	0
Czech Republic	40	Ο
International Average	e 37	
Lithuania	37	0
Italy	37	0
Bulgaria	35	0
Moldova	35	Ο
Slovak Republic	34	0
Singapore	34	0
Russian Federation	34	Ο
Hong Kong, SAR	34	0
Jordan	34	0
Cyprus	33	0
Turkey	32	0
Macedonia, Rep. of	30	0
Indonesia	29	
Iran, Islamic Rep.	29	•
Romania	29	0
South Africa	28	•
Israel	27	•
Chile	25	•
Tunisia	24	•
Thailand	23	•
Hungary	22	•
Philippines	22	
Morocco	16	▼

Country average vs. International average:		
Higher Not different Lower		

Correct Response:

Α

24

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Wolves marking territory

When male wolves place their scent on trees, they most likely are doing this in order to

- A. attract female wolves
- B. attract prey
- C. mark their territory against other wolves
- D. mark the location of food supplies

Item Number: L05

Correct Response:	С
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Finland	92	
Korea, Rep. of	91	
Canada	89	
Latvia (LSS)	86	
Australia	84	
Russian Federation	84	
Japan	83	
Belgium (Flemish)	81	
Netherlands	80	
New Zealand	80	
Hungary	79	
United States	78	
England	75	
Czech Republic	74	
Lithuania	72	
Slovak Republic	71	
Bulgaria	71	
Italy	70	
Chile	66	
Thailand	65	0
Slovenia	63	0
Slovenia International Average		
International Average Hong Kong, SAR	60 54	0
International Average	e 60	0
International Average Hong Kong, SAR	60 54	0
International Average Hong Kong, SAR Chinese Taipei	e 60 54 50	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep.	60 54 50 49	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia	 60 54 50 49 46 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania	 60 54 50 49 46 45 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel	 60 54 50 49 46 45 44 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore	 60 54 50 49 46 45 44 44 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova	 60 54 50 49 46 45 44 44 44 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of	 60 54 50 49 46 45 44 44 34 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of Indonesia	 60 54 50 49 46 45 44 44 34 33 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of Indonesia Jordan	 60 54 50 49 46 45 44 44 34 33 33 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of Indonesia Jordan Turkey	 60 54 50 49 46 45 44 44 34 33 33 32 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of Indonesia Jordan Turkey Philippines	 60 54 50 49 46 45 44 44 34 33 32 31 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of Indonesia Jordan Turkey Philippines Cyprus	 60 54 50 49 46 45 44 44 34 33 32 31 27 	0
International Average Hong Kong, SAR Chinese Taipei Iran, Islamic Rep. Malaysia Romania Israel Singapore Moldova Macedonia, Rep. of Indonesia Jordan Turkey Philippines Cyprus South Africa	 60 54 50 49 46 45 44 44 34 33 32 31 27 26 	

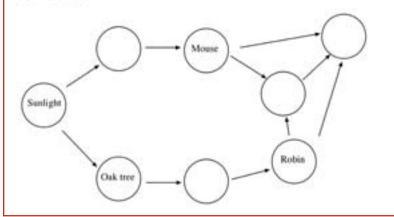
Country avera International av	•
Higher	
Not different	0
Lower	•

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Complete food web

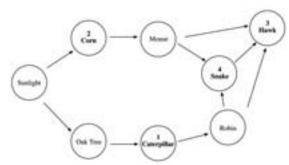
An incomplete food web has been drawn for you. Complete it by filling in each of the empty circles with the number of the correct animal or plant from the list. Remember that the arrows represent energy flow and go from the provider to the user.

- 1) Caterpillar
- 2) Corn
- 3) Hawk
- Snake



Item Number: L08

SCORING



Note: There are two possible food webs that are accepted as correct. An alternative, but less preferred, food web with the hawk (3) and snake (4) reversed is also scored as correct.

Correct Response

- Four placed correctly: 2,1,4,3 or names of animals/plants (corn, caterpillar, snake, hawk) as shown in the diagram above.
- Same as above but with hawk and snake reversed.

Incorrect Response

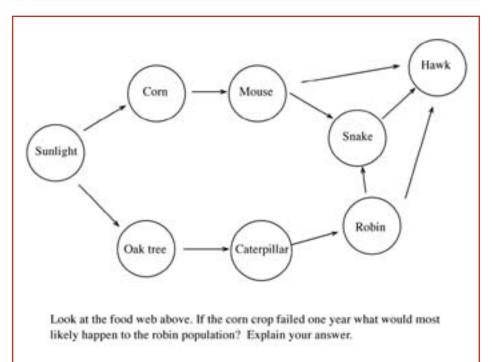
• Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Chinese Taipei89ASingapore89AKorea, Rep. of85AMalaysia84AEngland75ABulgaria70AHungary70AJapan68ARomania65OHong Kong, SAR64ACanada63OBelgium (Flemish)62OAustralia60OAustralia60ONetherlands58OThailand57OMoldova56OUnited States56OJordan51OJordan51OLatvia (LSS)50ONew Zealand48OPhilippines39TIthuania37TCyprus37TItran, Islamic Rep.35TIran, Islamic Rep.35TKorocco16TSouth Africa12T			
Singapore89AKorea, Rep. of85AMalaysia84AEngland75ABulgaria70AHungary70AJapan68ARomania67AHong Kong, SAR64ACanada63OBelgium (Flemish)62OAustralia60ONetherlands58OThailand58OThailand58OThailand58OSlovak Republic56OJordan51OJordan51OJordan51OJordan54OSlovenia48OItaly48OPhilippines39TLithuania37TTurkey36TSrael35TIran, Islamic Rep.35TIran, Islamic Rep.35TIndianic36TIndianic37TIndiania36TSlovenia36TItaly36TItaly36TItaly36TItaliania36TItaliania36TItaly36TItaly36TItaly36TItaliania36TItaliania36T <td>Chinese Taipei</td> <td>89</td> <td></td>	Chinese Taipei	89	
Korea, Rep. of 85 A Malaysia 84 A England 75 A Bulgaria 70 A Hungary 70 A Japan 68 A Russian Federation 67 A Indonesia 66 A Romania 65 O Hong Kong, SAR 64 A Canada 63 O Belgium (Flemish) 62 O Australia 60 O Netherlands 58 O Thailand 58 O Finland 57 O Moldova 56 O United States 56 O Jordan 51 O Italy 48 O Slovenia 48 O Italy 48 O New Zealand 48 O Philippines 39 T		89	
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Czech Republic600Australia600Netherlands580Thailand580Finland570Moldova560United States560International Average55Slovak Republic540Jordan510Latvia (LSS)500Macedonia, Rep. of480Slovenia480Italy480New Zealand480Philippines39VLithuania37VCyprus36VIuraisa36VIsrael35VIran, Islamic Rep.35VMorocco16V	Canada	63	0
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Netherlands580Thailand580Finland570Moldova560United States560International Average57Slovak Republic540Jordan510Latvia (LSS)500Macedonia, Rep. of480Slovenia480Italy480New Zealand480Philippines39₹Lithuania37₹Cyprus36₹Turkey36₹Israel35₹Iran, Islamic Rep.35₹Morocco16₹	Czech Republic	60	0
Thailand58OFinland57OMoldova56OUnited States56OInternational Average57Slovak Republic54OJordan51OLatvia (LSS)50OMacedonia, Rep. of48OSlovenia48OItaly48ONew Zealand48OPhilippines39VLithuania37VTurkey36VIsrael35VIran, Islamic Rep.35VMorocco16V	Australia	60	0
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Moldova560United States560International Average55Slovak Republic540Jordan510Latvia (LSS)500Macedonia, Rep. of480Slovenia480Italy480New Zealand480Philippines39*Lithuania37*Cyprus36*Iunisia36*Israel35*Iran, Islamic Rep.35*Morocco16*	Thailand	58	0
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International Average55Slovak Republic54OJordan51OLatvia (LSS)50OMacedonia, Rep. of48OSlovenia48OItaly48OItaly48ONew Zealand48OPhilippines39VLithuania37VCyprus36VTurkey36VIsrael35VIran, Islamic Rep.35VMorocco16V	Moldova	56	0
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Latvia (LSS)50OMacedonia, Rep. of48OSlovenia48OItaly48ONew Zealand48OPhilippines39VLithuania37VCyprus37VTurkey36VIsrael35VIran, Islamic Rep.35VMorocco16V	Slovak Ropublic	54	0
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	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia	50 48 48	0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy	50 48 48 48	0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand	50 48 48 48 48	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines	50 48 48 48 48 39	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania	50 48 48 48 48 39 37	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus	50 48 48 48 48 39 37 37	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus Turkey	50 48 48 48 39 37 37 36	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus Turkey Tunisia	50 48 48 48 39 37 37 36 36	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus Turkey Tunisia Israel	50 48 48 48 39 37 37 36 36 35	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus Turkey Tunisia Israel Iran, Islamic Rep.	50 48 48 48 39 37 37 36 36 35 35	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus Turkey Tunisia Israel Iran, Islamic Rep. Chile	50 48 48 48 39 37 37 36 36 35 35 28	0 0 0 0 0
	Jordan Latvia (LSS) Macedonia, Rep. of Slovenia Italy New Zealand Philippines Lithuania Cyprus Turkey Tunisia Israel Iran, Islamic Rep. Chile Morocco	50 48 48 48 39 37 37 36 36 35 35 28 16	0 0 0 0 0

Country avera International a	-
Higher	▲
Not different	○
Lower	▼

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

Food web: effect of crop failure



Item Number: N02

SCORING

Note: A correct response must include a feasible explanation directly relating the predicted change in robin population to the effect of corn crop failure on prey/predator relationships indicated in the food web. Responses do not have to use the specific terms decrease, increase, and same, as long as the explanation is clear with respect to the effect on the robin population. If more than one effect is given, assign credit corresponding to the first correct explanation.

Correct Response

- Robin population may decrease. Explanation based on predators (snakes/hawks) eating more robins if mice die.
- Robin population may increase. Explanation based on predators (snakes/hawks) dying due to lack of food (mice).
- Robin population would stay the same with a feasible explanation.
- Other acceptable explanation.

Incorrect Response

- Robin population would decrease. Incorrect explanation based on robins starving if snakes die (confuses prey/predator relationship).
- Robin population would decrease. Incorrect explanation based on the robin needing corn to survive.
- Robin population would stay the same. Incorrect explanation based on the robins not needing corn to survive or not being connected to corn in the food web. (Does not consider the effect of predators.)
- Mentions only that the whole food web will be upset and/or all the animals will die.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Singapore	72	
Chinese Taipei	55	
Korea, Rep. of	54	
England	46	
Belgium (Flemish)	45	
Australia	44	
Canada	38	
New Zealand	38	
Hong Kong, SAR	36	
Netherlands	36	0
United States	35	
Malaysia	31	0
Russian Federation	30	0
Japan	28	0
Hungary	28	0
Finland	26	0
International Average	e 26	
Czech Republic	26	0
Slovenia	23	0
Turkey	23	0
Italy	22	0
Slovak Republic	21	0
Macedonia, Rep. of	21	0
Latvia (LSS)	20	0
Bulgaria	20	0
Indonesia	19	▼
Romania	19	0
Philippines	17	•
Israel	15	▼
Lithuania	14	•
Thailand	14	•
Tunisia	13	•
Cyprus	13	•
Jordan	12	•
Chile	11	•
Iran, Islamic Rep.	9	•
Moldova	8	▼
South Africa	3	
Morocco	2	▼



Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Bacteria to convert milk to yogurt

Which of the following organisms are used to convert milk to yogurt?

A. Bacteria

B. Protozoa

C. Viruses

D. Algae

Item Number: N03

Correct Response:

Α

Japan	86	
Chinese Taipei	86	
Korea, Rep. of	75	
Hong Kong, SAR	73	
Russian Federation	73	
Czech Republic	71	
Jordan	71	
Iran, Islamic Rep.	67	
Cyprus	65	
Turkey	64	
Finland	64	
Bulgaria	62	0
Italy	62	0
Slovak Republic	61	0
Moldova	60	0
Latvia (LSS)	59	0
Netherlands	58	0
Lithuania	58	0
Thailand	57	0
Romania	56	0
International Average	e 5 4	
Slovenia	e 54 54	0
Slovenia Macedonia, Rep. of	e 54 54 54	0
Slovenia Macedonia, Rep. of Canada	54 54 54 52	0 0
Slovenia Macedonia, Rep. of Canada Tunisia	e 54 54 54 52 52	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary	e 54 54 52 52 52 47	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England	e 54 54 52 52 47 44	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia	54 54 52 52 52 47 44 44	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand	54 54 52 52 47 44 44 43	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States	 54 54 52 52 47 44 43 43 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco	 54 54 52 52 47 44 43 43 42 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel	 54 54 52 52 47 44 43 43 42 40 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia	 54 54 52 52 47 44 43 42 40 37 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia Singapore	 54 54 52 52 47 44 43 42 40 37 36 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia Singapore South Africa	 54 54 52 52 47 44 43 43 42 40 37 36 35 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia Singapore South Africa Malaysia	 54 54 52 52 47 44 43 43 42 40 37 36 35 34 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia Singapore South Africa Malaysia Philippines	 54 54 52 52 47 44 43 43 42 40 37 36 35 34 27 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia Singapore South Africa Malaysia Philippines Chile	 54 54 52 52 47 44 43 43 42 40 37 36 35 34 27 26 	0 0 0
Slovenia Macedonia, Rep. of Canada Tunisia Hungary England Australia New Zealand United States Morocco Israel Indonesia Singapore South Africa Malaysia Philippines	 54 54 52 52 47 44 43 43 42 40 37 36 35 34 27 	0 0

Country average vs. International average:	
Higher Not different Lower	

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Bone meal for plant growth

Some plants grow better if bone meal (ground-up bones) is spread around their roots. What does bone meal supply to plants that makes them grow better?

- A. Energy
- B. Minerals
- C. Vitamins
- D. Carbon dioxide
- E. Water

Item Number: N05

Correct Response: B

Latvia (LSS)	82	
Thailand	81	
Singapore	80	
Lithuania	79	
Hungary	78	
Malaysia	75	
Russian Federation	74	
Finland	73	
Chinese Taipei	72	
Czech Republic	69	
Japan	67	
Slovenia	65	
Canada	65	
Italy	60	0
United States	60	0
Moldova	59	0
England	59	0
Hong Kong, SAR	58	0
Korea, Rep. of	58	0
New Zealand	58	0
Tunisia	57	0
Bulgaria	57	0
Australia	57	0
International Average	e 56	
Iran, Islamic Rep.	52	0
Belgium (Flemish)	51	0
Romania	49	0
Slovak Republic	45	
Turkey	44	
Macedonia, Rep. of	44	
Netherlands	43	
Cyprus	42	▼
Chile	41	▼
Jordan	39	
Indonesia	34	
Philippines	31	▼
Israel	30	▼
South Africa	27	▼
Morocco	19	▼

Country avera International a	-
Higher	▲
Not different	○
Lower	▼

Content Domain	Cognitive Domain
Life Science	Understanding Simple Information

Definition of tissue

Tissues are found in living things. What is the definition of a tissue?

A. A group of cells with similar structure and function

B. A group of cells with different structure and function

C. A group of organelles contained inside a cell

D. A group of substances that make up the walls of a cell

Item Number: N06

Correct Response:

Α

Bulgaria	67	
Russian Federation	61	
Chinese Taipei	60	
Slovenia	57	
Lithuania	56	
Cyprus	56	
Korea, Rep. of	54	
Czech Republic	52	0
Slovak Republic	52	
Macedonia, Rep. of	50	
Jordan	49	
Belgium (Flemish)	47	0
Romania	47	0
United States	46	0
Netherlands	46	0
Moldova	46	0
Hungary	44	0
Canada	42	0
Israel	41	0
England	41	0
		<u> </u>
International Average		0
5		0
International Average	e 41	0 0
International Average Singapore	e 41 40	0 0 0
International Average Singapore Italy	41 40 38	0 0 0 0
International Average Singapore Italy Australia	e 41 40 38 37	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR	41 40 38 37 37	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan	40 40 38 37 37 37 37	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS)	e 41 40 38 37 37 37 36	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand	 41 40 38 37 37 37 36 33 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep.	 41 40 38 37 37 36 33 30 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland	 41 40 38 37 37 36 33 30 30 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines	 41 40 38 37 37 36 33 30 30 29 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines Morocco	 41 40 38 37 37 36 33 30 29 27 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines Morocco Turkey	 41 40 38 37 37 36 33 30 29 27 26 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines Morocco Turkey Malaysia	 41 40 38 37 37 36 33 30 30 29 27 26 25 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines Morocco Turkey Malaysia Thailand	 41 40 38 37 37 36 33 30 20 27 26 25 24 	0 0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines Morocco Turkey Malaysia Thailand Chile	 41 40 38 37 37 36 33 30 20 27 26 25 24 23 	0 0 0 0
International Average Singapore Italy Australia Hong Kong, SAR Japan Latvia (LSS) New Zealand Iran, Islamic Rep. Finland Philippines Morocco Turkey Malaysia Thailand Chile Indonesia	 41 40 38 37 37 36 33 30 20 27 26 25 24 23 22 	0 0 0 0 0

Country avera International a	-
Higher	▲
Not different	○
Lower	▼

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Mammal/lizards living in cold regions

Which statement best explains why mammals are found in very cold regions of the world but lizards are not?

- A. Both mammals and lizards are cold-blooded, but mammals have fur to keep them warm.
- B. Both mammals and lizards are warm-blooded, but lizards get too cold when they shed their skin.
- C. Since mammals, but not lizards, are warm blooded, their body temperature will adjust to match the external temperature.
- D. Since mammals, but not lizards, are warm-blooded, they will maintain their body temperature using heat from metabolic processes.

Item Number: N08

Overall Percent Correct

Russian Federation	62	
Bulgaria	59	
Korea, Rep. of	58	
Japan	56	
Netherlands	53	
Canada	52	
Hong Kong, SAR	51	
Chinese Taipei	49	
Slovak Republic	49	0
Thailand	49	
United States	47	
Singapore	47	0
Australia	46	0
Latvia (LSS)	45	0
Lithuania	44	0
Italy	44	0
Finland	43	0
Czech Republic	41	0
International Average	e 40	
England	40	0
Eligialiu	40	
New Zealand	40 40	0
5		0
New Zealand	40	0 0 0
New Zealand Belgium (Flemish)	40 39 39 39	0 0 0 0
New Zealand Belgium (Flemish) Hungary	40 39 39 39 39	0 0 0 0 0
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus	40 39 39 39 38 35	0 0 0 0 0
New Zealand Belgium (Flemish) Hungary Malaysia Romania	40 39 39 39 39	0 0 0 0 0 0
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus	40 39 39 39 38 35	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines	40 39 39 39 38 35 35	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel	40 39 39 39 38 35 35 35 34	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova	40 39 39 39 38 35 35 35 34 32	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan	40 39 39 38 35 35 35 34 32 30	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile	40 39 39 38 35 35 35 34 32 30 30	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan	40 39 39 38 35 35 34 32 30 30 29	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan Iran, Islamic Rep.	40 39 39 38 35 35 34 32 30 30 29 28	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan Iran, Islamic Rep. Indonesia	40 39 39 38 35 35 34 32 30 30 29 28 27	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan Iran, Islamic Rep. Indonesia Macedonia, Rep. of	40 39 39 38 35 35 34 32 30 30 29 28 27 27	
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan Iran, Islamic Rep. Indonesia Macedonia, Rep. of Tunisia	40 39 39 38 35 35 34 30 30 29 28 27 27 24	0 0 0 0 0 0
New Zealand Belgium (Flemish) Hungary Malaysia Romania Cyprus Philippines Israel Moldova Slovenia Chile Jordan Iran, Islamic Rep. Indonesia Macedonia, Rep. of Tunisia Turkey	40 39 39 38 35 35 34 30 30 29 28 27 27 24 23	

Country avera International av	-
Higher Not different Lower	

Correct Response:

D

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

Tree growth

Ethan hammered a nail into the trunk of a young tree. Explain why the nail was still at the same height from the ground twenty years later even though the tree had grown to a height of 22 meters.

Item Number: P03

SCORING

Note: A correct response is based on trees increasing in height as a result of growth at the tips of stems/branches (apical meristem) and trunk growth only resulting in increased diameter. Responses should be scored as correct if either of these two factors are included.

Correct Response

- Mentions that trees grow in height at the tips of stems/branches. (May also mention trunk growth increasing in diameter.)
- Mentions ONLY that the trunk grows in width or diameter but not height (without mentioning growth of the stem or branches).
- Other correct.

Incorrect Response

- Mentions only that the trunk does not grow (is dead).
- Mentions that the nail stops or prevents growth.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Belgium (Flemish)	65	
Finland	64	
Canada	59	
Australia	57	
Japan	57	
Netherlands	56	
New Zealand	56	
Thailand	55	
Slovak Republic	55	
England	55	
Chinese Taipei	53	
Moldova	53	
Hungary	50	0
Singapore	49	0
Czech Republic	48	0
Russian Federation	48	0
Cyprus	47	0
Slovenia	45	0
United States	45	0
Turkey	44	0
Italy	43	0
Latvia (LSS)	42	0
International Average	e 41	
Hong Kong, SAR	40	0
Israel	38	0
Iran, Islamic Rep.	37	0
Lithuania	36	0
Romania	36	0
Malaysia	33	▼
Korea, Rep. of	33	▼
Chile	30	
Bulgaria	29	▼
Jordan	24	▼
Indonesia	23	▼
Tunisia	22	0 V V V V V V V V V
Macedonia, Rep. of	21	▼
Philippines	9	▼
South Africa	8	
Morocco	2	▼

Country average International av	
Higher	
Not different	0
Lower	V

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Hibernating animals

Animals hibernate to survive cold weather and poor food supplies. Which of the following occurs in animals when they hibernate?

- A. Their blood stops circulating.
- B. Their body temperature increases.
- C. Their body fat remains constant.
- D. Their rate of metabolism decreases.

Item Number: P04

Lithuania 77

Overall Percent Correct

Lithuania	77	
Hungary	75	
Czech Republic	75	
Slovak Republic	74	
Bulgaria	72	
Thailand	69	
Finland	67	
Russian Federation	66	
Latvia (LSS)	64	
Indonesia	63	
Slovenia	54	0
Moldova	54	0
Netherlands	54	0
Singapore	53	0
Australia	51	0
Chinese Taipei	50	0
Cyprus	50	0
Iran, Islamic Rep.	50	0
Italy	50	0
Canada	50	0
Malaysia	49	0
International Averag	e 48	
International Average Belgium (Flemish)	e 48 48	0
International Average Belgium (Flemish) United States	e 48 48 47	0 0
International Average Belgium (Flemish) United States Hong Kong, SAR	e 48 48 47 47	0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania	e 48 48 47 47 46	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel	e 48 48 47 47 46 44	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand	e 48 48 47 47 46 44 33	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England	e 48 48 47 47 46 44 33 33	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan	e 48 48 47 47 46 44 33 33 31	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of	e 48 48 47 47 46 44 33 33 31 30	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile	e 48 48 47 47 46 44 33 33 31 30 30	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines	e 48 48 47 47 46 44 33 33 31 30 30 29	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines Japan	e 48 48 47 47 46 44 33 31 30 30 29 28	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines Japan Turkey	e 48 48 47 46 44 33 31 30 30 29 28 25	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines Japan Turkey Tunisia	e 48 47 47 46 44 33 31 30 29 28 25 23	0 0 0 0
International Averag Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines Japan Turkey Tunisia Korea, Rep. of	e 48 48 47 47 46 44 33 33 31 30 29 28 25 23 22	0 0 0 0
International Average Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines Japan Turkey Tunisia Korea, Rep. of South Africa	e 48 48 47 47 46 44 33 33 31 30 29 28 25 23 22 20	0 0 0 0
International Averag Belgium (Flemish) United States Hong Kong, SAR Romania Israel New Zealand England Jordan Macedonia, Rep. of Chile Philippines Japan Turkey Tunisia Korea, Rep. of	e 48 48 47 47 46 44 33 33 31 30 29 28 25 23 22	0 0 0

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

Correct Response:

D

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Digestion in stomach

What digestive substance is found in the stomach? What does it do?

Item Number: P06

SCORING

Note: To be correct, a response must name a specific digestive substance found in the stomach (enzyme, hydrochloric acid, or gastric juices) with or without a full description of its function. A general response related to "acid" will be accepted as correct, but an incorrect acid will be scored as incorrect.

Correct Response

- Names enzyme, hydrochloric acid or gastric juices with an explanation based on breaking down food (particles) or protein.
- · Names enzyme, hydrochloric acid or gastric juices without a complete explanation.
- Names acid with or without a complete explanation (does not explicitly name hydrochloric acid).
- Other correct.

Incorrect Response

- Names an incorrect acid not involved in digestion in stomach (lactic acid, amino acid, sulfuric acid, etc.).
- Names a substance (or body part) not found in the stomach but involved in digestion (saliva, bile salts, bacteria, intestines, etc.).
- Mentions digesting (breaking down) food but no specific substance or body part is named.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Slovak Republic	75	
Czech Republic	64	
Hong Kong, SAR	64	
Slovenia	62	
Romania	62	
Moldova	60	
Hungary	59	
Latvia (LSS)	57	
Singapore	56	
Bulgaria	55	
Netherlands	54	0
Chinese Taipei	54	
Russian Federation	54	
Japan	53	
England	51	
Australia	49	0
Lithuania	49	0
New Zealand	49	0
United States	46	0
Belgium (Flemish)	46	0
Canada	43	0
Korea, Rep. of	42	0
Thailand	41	0
International Averag	e 41	
Macedonia, Rep. of	39	0
Jordan	37	0
Italy	35	0
Finland	34	0
Malaysia	29	▼
Iran, Islamic Rep.	26	▼
Chile	24	▼
Indonesia	22	▼
Israel	19	▼
Cyprus	14	▼
Turkey	13	▼
Tunisia	6	
Philippines	6	▼
South Africa	4	0 V V V V V V V V V
Morocco	1	▼

Country average vs. International average:		
Higher		
Not different	0	
Lower	V	

Content Domain	Cognitive Domain
Life Science	Understanding Complex Information

Two outcomes of introducing new species

A new species of fish was released into a lake. State two unwanted outcomes that could arise from the introduction of this new species.

1.

2.

Item Number: R03D

SCORING

Note: Each of the two outcomes are scored separately. The same score may be used twice, since they are based on general outcome categories. However, if the two outcomes are essentially the same, the second outcome should be scored as incorrect. If only one outcome is given, the second should be scored as incorrect.

Correct Response

- Mentions competition with native species (e.g. overpopulation, eating the limited food supply).
- · Mentions new species introducing diseases (bacteria, parasites, etc.).
- Mentions effects of predation (new species killing off existing species or vice-versa).
- Mentions that the new species cannot survive in the lake (extinction due to inhospitable habitat).
- · Mentions upsetting food web or ecological balance.
- Mentions mating with existing species.
- Other correct.

Incorrect Response

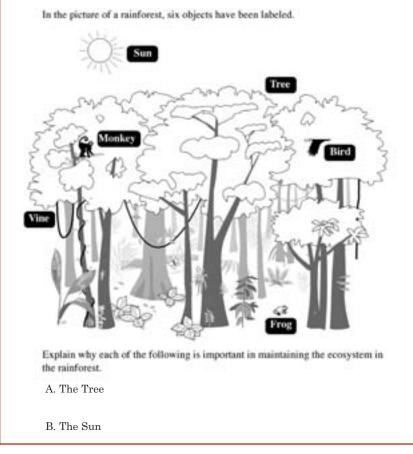
- Response too general.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Australia	74	
New Zealand	60	
Slovak Republic	58	
Canada	57	
Singapore	57	
Thailand	57	
England	56	
Finland	56	
Latvia (LSS)	53	
Chinese Taipei	52	
Belgium (Flemish)	50	
Moldova	48	0
Netherlands	47	0
Israel	47	0
Russian Federation	46	0
Lithuania	46	0
Hungary	44	0
Slovenia	43	0
Bulgaria	43	0
United States	42	0
International Average		
International Average		0
	e 40	0
Italy	40 40	0 0 0
ltaly Japan	40 40 39	0 0 0 0
Italy Japan Romania	40 40 39 36	0 0 0 0 0
Italy Japan Romania Tunisia	 40 40 39 36 35 35 34 	0 0 0 0 0
ltaly Japan Romania Tunisia Cyprus	 40 40 39 36 35 35 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia	 40 40 39 36 35 35 34 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of	 40 40 39 36 35 35 34 33 32 30 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia	 40 40 39 36 35 35 34 33 32 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of	 40 40 39 36 35 35 34 33 32 30 29 28 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR	 40 40 39 36 35 35 34 33 32 30 29 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR Chile	 40 40 39 36 35 35 34 33 32 30 29 28 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR Chile Indonesia	 40 40 39 36 35 35 34 33 32 30 29 28 23 22 22 22 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR Chile Indonesia Iran, Islamic Rep.	 40 40 39 36 35 35 34 33 32 30 29 28 23 22 22 21 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR Chile Indonesia Iran, Islamic Rep. Turkey	 40 40 39 36 35 35 34 33 32 30 29 28 23 22 22 22 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR Chile Indonesia Iran, Islamic Rep. Turkey Jordan	 40 40 39 36 35 35 34 33 32 30 29 28 23 22 22 21 	0 0 0 0 0
Italy Japan Romania Tunisia Cyprus Czech Republic Korea, Rep. of Malaysia Macedonia, Rep. of Hong Kong, SAR Chile Indonesia Iran, Islamic Rep. Turkey Jordan Morocco	 40 40 39 36 35 34 33 32 30 29 28 23 22 22 21 19 	0 0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower	•	

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

Importance of trees/sun in rain forest



Item Number: X02A

SCORING

A: Scoring for Trees

Note: If student response refers to oxygen/carbon dioxide cycle, score as correct even if other reasons are given. If more than one reason is given, assign credit corresponding to the first correct reason.

Correct Response

- Trees produce oxygen and/or use carbon dioxide.
- Trees provide food or energy.
- Trees provide a place to hide/shelter.
- Trees provide shade or protection from the Sun.
- Other correct.

Incorrect Response

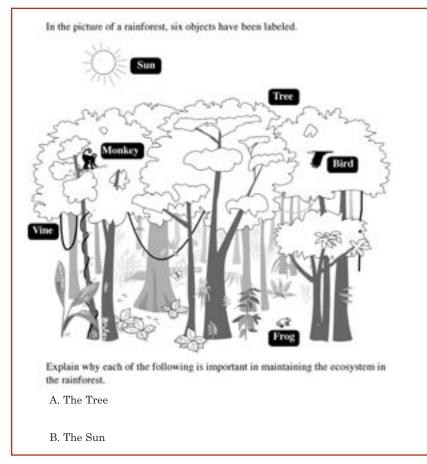
- Response too vague.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Singapore	93	
Australia	91	
Canada	90	
England	88	
Chinese Taipei	87	
Korea, Rep. of	87	
Thailand	87	
Belgium (Flemish)	86	
United States	85	
New Zealand	83	
Finland	83	
Japan	83	
Hong Kong, SAR	82	
Slovak Republic	80	
Hungary	79	
Netherlands	79	0
Cyprus	79	
Malaysia	79	
Latvia (LSS)	79	
Slovenia	78	0
Tunisia	77	
Czech Republic	76	0
International Average	e 72	
Indonesia	72	0
Italy	71	0
Jordan	69	0
Russian Federation	64	
Lithuania	63	
Turkey	61	▼
Bulgaria	60	▼
Romania	60	
Israel	59	
Philippines	59	
Moldova	56	
Macedonia, Rep. of	49	▼
Chile	48	▼
Morocco	44	
Iran, Islamic Rep.	42	0 * * * * * * * *
South Africa	30	▼

Country average vs. International average:		
Higher		
Not different	0	
Lower	▼	

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

Importance of trees/sun in rain forest



Item Number: X02B

SCORING

B: Scoring for Sun

Note: If response refers explicitly to photosynthesis, score as correct even if other reasons are given. If more than one reason is given, assign credit corresponding to the first correct reason.

Correct Response

- Sun is needed for photosynthesis (by plants).
- Sun is needed in order for chlorophyll in plants to produce food. (Does not explicitly mention photosynthesis).
- Sun provides energy and/or is needed for plant growth. (No mention of photosynthesis or chlorophyll).
- Sun provides heat (warmth) or maintains the temperature. (No mention of photosynthesis or chlorophyll).
- Sun provides light and/or enables animals to see.

• Other correct.

Incorrect Response

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

Singapore	91	
Canada	88	
Australia	88	
Korea, Rep. of	86	
Japan	85	
Thailand	84	
England	84	
Chinese Taipei	82	
New Zealand	82	
Finland	81	
Belgium (Flemish)	81	
United States	81	
Hong Kong, SAR	79	
Latvia (LSS)	79	
Malaysia	78	
Slovenia	77	
Netherlands	76	
Tunisia	69	0
Czech Republic	69	0
Jordan	68	0
		<u> </u>
International Average		
International Average Slovak Republic		0
	e 68	
Slovak Republic	e 68 67	0 0 0
Slovak Republic Cyprus	e 68 67 66	0 0
Slovak Republic Cyprus Indonesia	 68 67 66 65 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary	 68 67 66 65 64 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy	 68 67 66 65 64 62 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation	 68 67 66 65 64 62 60 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines	 68 67 66 65 64 62 60 59 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania	 68 67 66 65 64 62 60 59 57 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey	 68 67 66 65 64 62 60 59 57 56 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania	 68 67 66 65 64 62 60 59 57 56 56 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania Israel	 68 67 66 65 64 62 60 59 57 56 55 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania Israel Moldova	 68 67 66 65 64 62 60 59 57 56 55 55 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania Israel Moldova Iran, Islamic Rep.	 68 67 66 65 64 62 60 59 57 56 55 55 48 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania Israel Moldova Iran, Islamic Rep. Bulgaria	 68 67 66 65 64 62 60 59 57 56 55 48 48 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania Israel Moldova Iran, Islamic Rep. Bulgaria Chile	 68 67 66 65 64 62 60 59 57 56 55 48 48 46 	0 0 0 0
Slovak Republic Cyprus Indonesia Hungary Italy Russian Federation Philippines Romania Turkey Lithuania Israel Moldova Iran, Islamic Rep. Bulgaria Chile Macedonia, Rep. of	 68 67 66 65 64 62 60 59 57 56 55 48 48 46 44 	0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower	•	

Content Domain	Cognitive Domain
Physics	Understanding Simple Information

Energy released from car engine

Most of the chemical energy released when gasoline burns in a car engine is not used to move the car, but is changed into

A. electricity

B. heat

C. magnetism

D. sound

Item Number: B02

Correct Response: B

Hungary	76	
Korea, Rep. of	74	
Russian Federation	72	
Bulgaria	71	
Slovenia	67	
England	67	
Finland	66	
Czech Republic	66	
Israel	65	
Japan	64	
Canada	63	
Netherlands	63	0
Cyprus	63	
Moldova	62	0
Slovak Republic	61	0
Singapore	60	0
Turkey	60	0
Romania	59	0
United States	59	0
Australia	59	0
Latvia (LSS)	59	0
New Zealand	58	0
International Average	58	
Jordan	56	0
Thailand	56	0
Iran, Islamic Rep.	54	0
Italy	53	0
Lithuania	52	▼
Chinese Taipei	52	▼
Philippines	51	▼
Malaysia	50	▼
Belgium (Flemish)	49	▼
Hong Kong, SAR	49	▼
Macedonia, Rep. of	48	▼
Tunisia	46	▼
Indonesia	42	 * *<
Morocco	40	▼
South Africa	40	
Chile	34	-
Chile	54	•

Country average vs. International average:		
Higher Not different		
Lower	V	

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Greatest density from mass/volume table

Object	Mass of Object	Volume of Object
w	11.0 grams	24 cubic centimeters
х	11.0 grams	12 cubic centimeters
Y	5.5 grams	4 cubic centimeters
Z	5.5 grams	11 cubic centimeters

Α.	w

- B. X
- C. Y
- D. Z

Item Number: B03

Correct Response: C

Chinese Taipei	52	
Hong Kong, SAR	50	
Korea, Rep. of	47	
Finland	46	
Belgium (Flemish)	46	
Israel	44	
Singapore	44	
Japan	42	
Netherlands	38	
Hungary	36	
Russian Federation	35	0
Bulgaria	35	0
Slovak Republic	32	0
Slovenia	32	0
Canada	32	0
Malaysia	31	0
Latvia (LSS)	30	0
Lithuania	30	0
Czech Republic	29	0
International Average	28	
International Average		
Australia	25	0
		0
Australia	25	0 0
Australia Romania	25 25	0 0
Australia Romania Macedonia, Rep. of	25 25 24	0 0
Australia Romania Macedonia, Rep. of Moldova	25 25 24 23	0 0
Australia Romania Macedonia, Rep. of Moldova United States	25 25 24 23 23 23 23 21	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy	25 25 24 23 23 23	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey	25 25 24 23 23 23 23 21	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus	25 25 24 23 23 23 23 21 21	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand	25 25 24 23 23 23 21 21 21 20	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines	25 25 24 23 23 23 21 21 20 19	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan Iran, Islamic Rep.	25 25 24 23 23 21 21 21 20 19 19	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan	25 25 24 23 23 23 21 21 20 19 19 18	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan Iran, Islamic Rep.	25 25 24 23 23 21 21 21 20 19 19 18 17	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan Iran, Islamic Rep. South Africa New Zealand Chile	25 25 24 23 23 21 21 20 19 19 18 17 17 17 17	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan Iran, Islamic Rep. South Africa New Zealand Chile Tunisia	25 25 24 23 23 21 21 20 19 19 18 17 17	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan Iran, Islamic Rep. South Africa New Zealand Chile	25 25 24 23 23 21 21 20 19 19 19 18 17 17 17 17 11 10 8	0 0
Australia Romania Macedonia, Rep. of Moldova United States Italy Turkey Cyprus Thailand Philippines England Jordan Iran, Islamic Rep. South Africa New Zealand Chile Tunisia	25 25 24 23 23 21 21 20 19 19 19 18 17 17 17 17 11 10	0

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

Content Domain	Cognitive Domain
Physics	Understanding Simple Information

Color reflecting most light

The walls of a building are to be painted to reflect as much light as possible. What color should they be painted?

A. White

B. Red

C. Black

D. Pink

Item Number: B06

Correct Response: A

Belgium (Flemish)	94	
Hungary	94	
Slovak Republic	92	
Netherlands	92	
Singapore	91	
Slovenia	91	
Czech Republic	90	
Russian Federation	90	
Australia	89	
England	89	
Chinese Taipei	89	
Lithuania	88	
Malaysia	87	
Japan	87	
Bulgaria	86	
Romania	86	0
Latvia (LSS)	86	
Hong Kong, SAR	85	
Finland	85	0
Israel	85	
Canada	83	0
United States	83	0
International Average	82	
Italy	82	0
New Zealand	81	0
Philippines	80	0
Korea, Rep. of	78	
Indonesia	78	
Macedonia, Rep. of	77	
Cyprus	76	
Moldova	75	
Turkey	75	
Chile	75	
Iran, Islamic Rep.	73	
Thailand	73	
Tunisia	73	
Jordan	70	
South Africa	69	
Morocco	56	
	50	•

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

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Light rays through magnifying glass

Г

Which diag magnifying		hat happens when light passes throug
	А	
	В	
	С	
	D	
	Е	$ \rightarrow $

Overall Percent Correct

Japan	88	
Chinese Taipei	73	
Bulgaria	70	
Russian Federation	67	
Korea, Rep. of	61	
Singapore	54	
Malaysia	52	
Lithuania	51	
Finland	50	
Czech Republic	49	0
Slovak Republic	49	0
Moldova	48	0
Australia	48	0
Hungary	47	0
Netherlands	47	0
Canada	46	
Hong Kong, SAR	43	0
Romania	43	0
International Averag	e 42	
Slovenia	41	0
Belgium (Flemish)	41	0
Belgium (Flemish) New Zealand	41 40	0
5		0
New Zealand Thailand Iran, Islamic Rep.	40 40 39	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS)	40 40	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile	40 40 39 38 37	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan	40 40 39 38 37 37	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile	40 40 39 38 37 37 36	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan	40 40 39 38 37 37 36 34	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States	40 40 39 38 37 37 36 34 31	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy	40 40 39 38 37 37 36 34	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England	40 40 39 38 37 37 36 34 31 31 29	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus	40 40 39 38 37 37 36 34 31 31 29 28	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus Indonesia	40 40 39 38 37 37 36 34 31 31 29 28 24	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus Indonesia Turkey	40 40 39 38 37 37 36 34 31 31 29 28 24 23	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus Indonesia Turkey Tunisia	40 40 39 38 37 37 36 34 31 31 29 28 24 23 21	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus Indonesia Turkey Tunisia Macedonia, Rep. of	40 40 39 38 37 37 36 34 31 31 29 28 24 23 21 20	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus Indonesia Turkey Tunisia Macedonia, Rep. of Philippines	40 40 39 38 37 37 36 34 31 31 29 28 24 23 21 20 19	0 0 0
New Zealand Thailand Iran, Islamic Rep. Latvia (LSS) Chile Jordan United States Italy Morocco Israel England Cyprus Indonesia Turkey Tunisia Macedonia, Rep. of	40 40 39 38 37 37 36 34 31 31 29 28 24 23 21 20	0 0 0

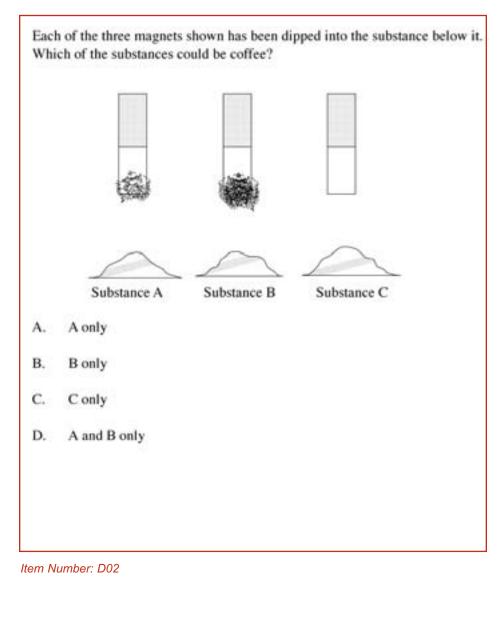
Country average vs. International average:		
Higher		
Not different	0	
Lower	▼	

Correct Response:

В

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Magnetic substances



Overall Percent Correct

Hungary	92		
Czech Republic	91		
Bulgaria	91		
Korea, Rep. of	90		
Singapore	89		
England	89		
Slovak Republic	88		
Russian Federation	88		
Japan	85		
Slovenia	84		
Australia	83		
Lithuania	82		
Finland	82		
Canada	81		
Romania	79		
Macedonia, Rep. of	78		
Belgium (Flemish)	78		
Chinese Taipei	77		
Malaysia	75	0	
Jordan	75	0	
Netherlands	74	0	
Hong Kong, SAR	74	0	
New Zealand	73	0	
Italy	73	0	
United States	72	0	
International Average	e 72		
Moldova	71	0	
Turkey	70	0	
Cyprus	69	0	
Israel	67	0	
Thailand	58	▼	
Latvia (LSS)	58	▼	
Chile	53	▼	
Tunisia	53	▼	
Iran, Islamic Rep.	52	▼	
Indonesia	47	* * * * *	
South Africa	36	▼	
Morocco	29	▼	
Philippines	27		
Country average vs.			

International average:		
Higher Not different Lower		

Correct Response:

С

42

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Sequence of energy changes

Chemio	cal Energy — Heat Energy — Mechanical Energy (with wasted heat)
The	sequence of energy changes shown in the diagram explains which even
A.	A flashlight is on.
В.	A candle burns.
С,	Gasoline burns to power a car.
D.	Electric current runs a refrigerator.

Item Number: D04

Correct Response: C

Singapore	77	
Hungary	74	
Chinese Taipei	72	
England	71	
Slovak Republic	67	
Cyprus	67	
Russian Federation	67	
Australia	67	
Israel	66	
Hong Kong, SAR	66	
Italy	66	
Belgium (Flemish)	65	
Netherlands	65	
Iran, Islamic Rep.	65	
Thailand	64	
United States	64	
Bulgaria	64	0
Japan	63	
New Zealand	61	0
Canada	61	0
Korea, Rep. of	60	0
Slovenia	59	0
International Average	59	
Jordan	58	0
Romania	56	0
Tunisia	55	▼
Czech Republic	55	0
Latvia (LSS)	54	0
Moldova	53	0
Indonesia	53	▼
Malaysia	52	▼
Lithuania	51	▼
Macedonia, Rep. of	51	▼
Chile	50	▼
Morocco	48	▼
Finland	45	
Philippines	39	▼
Turkey	36	▼
South Africa	20	▼

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

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Why light-colored clothes are cooler

On a warm sunny day, you will feel cooler wearing lightcolored clothes because they

- A. reflect more radiation
- B. prevent sweating
- C. are not as heavy as dark clothes
- D. let more air in

Item Number: F02

Correct Response: A

Hungary	88	
Netherlands	88	
Chinese Taipei	87	
Belgium (Flemish)	86	
Czech Republic	86	
Slovak Republic	85	
Korea, Rep. of	85	
Hong Kong, SAR	84	
Singapore	83	
Russian Federation	83	
Slovenia	81	
Japan	79	
Malaysia	79	
Australia	77	
Latvia (LSS)	77	
Lithuania	75	
England	74	
Israel	72	
Bulgaria	71	0
Finland	71	
Canada	69	0
Macedonia, Rep. of	69	0
International Average	e 65	
United States	61	0
Italy	61	0
Romania	58	0
Iran, Islamic Rep.	58	▼
New Zealand	55	▼
Moldova	55	▼
Indonesia	52	▼
Cyprus	52	
Jordan	47	▼
Philippines	43	
Thailand	39	▼
Morocco	38	▼
Chile	37	▼
Turkey	34	▼
Tunisia	31	0 * * * * * * * *
South Africa	18	▼

Country average vs. International average:		
Higher Not different Lower		

Content Domain	Cognitive Domain
Physics	Understanding Simple Information

Energy stored in food

People get energy from the food they eat. Where does the energy stored in food come from?

- A. Fertilizer
- B. The Sun
- C. Vitamins
- D. The soil

Item Number: H05

Correct Response: B

Singapore	55	
Iran, Islamic Rep.	53	
Japan	45	
Malaysia	44	
England	42	
Korea, Rep. of	41	
Hong Kong, SAR	39	
Finland	38	
Philippines	38	
Jordan	34	
Australia	33	
Indonesia	32	
Russian Federation	29	0
United States	26	0
Chinese Taipei	25	0
New Zealand	25	0
International Averag	e 24	
Canada	23	0
Bulgaria	22	0
Thailand	21	0
Hungary	19	▼
Netherlands	19	•
Czech Republic	18	▼
Macedonia, Rep. of	18	•
Italy	18	•
Slovak Republic	17	•
Cyprus	16	•
South Africa	15	▼
Latvia (LSS)	15	•
Slovenia	14	▼
Turkey	14	▼
Moldova	14	▼
Morocco	12	▼
Chile	11	▼
Romania	11	
Lithuania	11	▼
Israel	11	▼
Belgium (Flemish)	9	▼
Tunisia	6	▼

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

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Evaporation rate by surface area

A student put 100 mL of water in each the sun for one day. Which container w evaporation?	of the open containers and let them stand in ould probably lose the most water due to
A.	B.
C.	D.

Item Number: J04

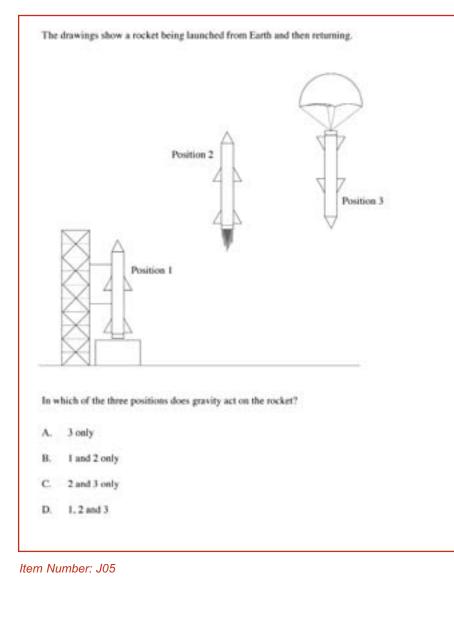
Correct Response: C

Singapore	98	
Hungary	95	
Korea, Rep. of	95	
Russian Federation	95	
Czech Republic	94	
Japan	94	
Slovak Republic	94	
Hong Kong, SAR	93	
Moldova	93	
Bulgaria	93	
Malaysia	93	
Chinese Taipei	93	
England	92	
Canada	91	
Australia	90	
Latvia (LSS)	90	
Lithuania	90	0
Israel	89	
Netherlands	89	0
Romania	88	0
Cyprus	88	0
New Zealand	88	0
Jordan	87	0
Finland	86	0
Thailand	85	0
International Average	e 84	
Belgium (Flemish)	84	0
United States	84	0
Slovenia	83	0
Macedonia, Rep. of	83	0
Indonesia	75	
Tunisia	75	
Turkey	74	▼
Chile	72	▼
Italy	70	▼
Iran, Islamic Rep.	69	* * * * * *
Philippines	60	▼
South Africa	53	▼
Morocco	45	

Country average vs. International average:		
Higher		
Not different	0	
Lower	•	

Content Domain	Cognitive Domain
Physics	Understanding Simple Information

Gravity acting on rocket



D

Overall Percent Correct

Slovak Republic	68	
Czech Republic	65	
Hungary	65	
Finland	53	
Singapore	49	
Chinese Taipei	48	
Lithuania	48	
Slovenia	46	
United States	46	
Russian Federation	46	0
Australia	45	
Canada	45	Ο
England	43	Ο
Moldova	42	0
Japan	40	0
New Zealand	39	0
Netherlands	39	0
International Average	36	
Jordan	36	0
Bulgaria	35	0
Thailand	30	0
Iran, Islamic Rep.	30	0
Cyprus	30	Ο
Romania	29	Ο
Korea, Rep. of	29	•
Belgium (Flemish)	29	•
Philippines	27	•
Israel	26	•
Italy	25	•
Hong Kong, SAR	24	•
Latvia (LSS)	24	•
Chile	23	▼
Turkey	22	▼
Malaysia	21	▼
Macedonia, Rep. of	19	 * *<
Tunisia	19	▼
Morocco	17	▼
South Africa	15	▼

Country avera International av	-
Higher	
Not different	0
Lower	V

Correct Response:

47

Content Domain	Cognitive Domain
Physics	Understanding Simple Information

Sunscreen to protect against radiation

Sunscreen is used to protect the skin from exposure to which type of solar radiation?

A. Visible

B. X-rays

C. Infrared

D. Ultraviolet

E. Microwaves

Item Number: J08

Correct Response: D

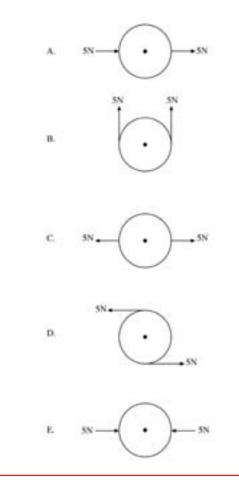
Chinese Taipei	94	
Singapore	91	
Hungary	87	
Thailand	86	
Australia	85	
Hong Kong, SAR	84	
Slovenia	84	
New Zealand	80	
Japan	79	
Slovak Republic	79	
Korea, Rep. of	77	
Finland	77	
Chile	76	
Czech Republic	75	
Netherlands	75	
Canada	75	
Indonesia	72	
Lithuania	70	
United States	69	
Italy	68	0
Russian Federation	65	0
Belgium (Flemish)	64	0
England	64	0
Bulgaria	62	0
International Averag	e 62	
Philippines	57	0
Latvia (LSS)	54	0
Malaysia	54	▼
Romania	48	▼
Moldova	45	▼
Jordan	43	▼
Israel	39	▼
Macedonia, Rep. of	36	▼
Tunisia	33	▼
Turkey	32	▼
Cyprus	26	▼
South Africa	18	▼
Morocco	18	
Iran, Islamic Rep.	17	▼

Country avera International av	•
Higher	
Not different	0
Lower	•

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Rotating forces on wheel

A uniform wheel is free to rotate on its axle at its center. It is acted on by two forces in the same plane. Each force has the same size, equal to 5N (Newtons). In which case will the wheel rotate?



Item Number: L01

Correct Response: D

Japan	76	
Hungary	74	
Lithuania	72	
Latvia (LSS)	72	
Czech Republic	69	0
Netherlands	69	0
Finland	69	
Slovenia	69	0
Russian Federation	68	0
Thailand	67	0
Bulgaria	67	0
Italy	66	0
Canada	66	0
Slovak Republic	66	0
Belgium (Flemish)	64	0
Korea, Rep. of	63	0
Romania	63	0
United States	62	0
Moldova	62	0
International Average	e 62	
Hong Kong SAR	62	0
Hong Kong, SAR England	62 61	0
England	61	0
England Chile		
England Chile Australia	61 60	0 0
England Chile	61 60 60	0 0 0
England Chile Australia Singapore	61 60 60 60	0 0 0 0
England Chile Australia Singapore Jordan	61 60 60 60	0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia	61 60 60 60 60 59	0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia	61 60 60 60 60 59 58	0 0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei	61 60 60 60 59 58 58	0 0 0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus	61 60 60 60 59 58 58 58	0 0 0 0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei	61 60 60 60 59 58 58 58 58 58 58	
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus Turkey	61 60 60 60 59 58 58 58 58 58 57 57	0 0 0 0 0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus Turkey Israel Morocco	61 60 60 59 58 58 58 58 57 57 57	
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus Turkey Israel Morocco Iran, Islamic Rep.	61 60 60 59 58 58 58 57 57 57 55	0 0 0 0 0 0 0 0 0 0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus Turkey Israel Morocco	61 60 60 59 58 58 58 57 57 57 57 55 54	
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus Turkey Israel Morocco Iran, Islamic Rep. Macedonia, Rep. of Indonesia	61 60 60 59 58 58 58 57 57 57 57 55 54 54	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
England Chile Australia Singapore Jordan New Zealand Tunisia Malaysia Chinese Taipei Cyprus Turkey Israel Morocco Iran, Islamic Rep. Macedonia, Rep. of	61 60 60 59 58 58 58 57 57 57 55 54 54 52	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Country avera International a	-
Higher Not different Lower	

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Efficiency of machines

Machine A and Machine B are each used to pump water from a river. The table shows what volume of water each machine removed in one hour and how much gasoline each of them used.

	Volume of Water Removed in 1 Hour (liters)	Gasoline Used in 1 Hour (liters)
Machine A	1000	1.25
Machine B	500	0.5

a) Which machine is more efficient in converting the energy in gasoline to work?

Answer:

b) Explain your answer.

Item Number: L04

SCORING

Note: A correct response must identify B and include an explanation based on the concept of energy efficiency (ratio of energy output to energy input) that compares the volume of water pumped for an equivalent volume of gasoline used for the two machines. Responses based ONLY on comparing the amount of gasoline used OR the amount of water pumped by the machines without considering the ratio of water/gasoline are scored as incorrect. No credit is lost for missing/incorrect units or for minor computational errors, provided the correct conclusion and explanation are given.

Correct Response

• B. With correct explanation based on the concept of energy efficiency (B uses less gasoline than A for an equivalent volume of water pumped).

Incorrect Response

- B. It uses less gasoline (no comparison of efficiency based on volume of water pumped).
- B. Other incorrect/inadequate or no explanation.
- A. It removes more water in 1 hour (no comparison of efficiency based on gas used).
- A. Other incorrect/inadequate or no explanation.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Netherlands	58	
Korea, Rep. of	52	
Belgium (Flemish)	51	
Slovak Republic	50	
Singapore	49	
Australia	49	
Japan	46	
Chinese Taipei	44	
Canada	43	
New Zealand	42	
England	42	
Finland	40	0
Lithuania	38	0
Hungary	38	0
Israel	35	0
Slovenia	33	0
Russian Federation	33	0
Hong Kong, SAR	32	0
International Average	e 31	
Czech Republic	30	0
CZCCII IICPUDIIC	50	0
United States	30	0
		-
United States	30	0 0 0
United States Thailand	30 28	0 0 0 0
United States Thailand Bulgaria	30 28 28	0 0 0 0 0
United States Thailand Bulgaria Cyprus	30 28 28 27	0 0 0 0 0 0
United States Thailand Bulgaria Cyprus Latvia (LSS)	30 28 28 27 26	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy	30 28 28 27 26 23	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania	30 28 27 26 23 22	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep.	30 28 27 26 23 22 21	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of	30 28 27 26 23 22 21 20	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia	30 28 27 26 23 22 21 20 20	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia	30 28 27 26 23 22 21 20 20 20	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia Moldova	30 28 27 26 23 22 21 20 20 20 20 19	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia Moldova Jordan	30 28 27 26 23 22 21 20 20 20 19 19	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia Moldova Jordan Tunisia	30 28 27 26 23 22 21 20 20 20 20 19 19 19	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia Moldova Jordan Tunisia Turkey	30 28 27 26 23 22 21 20 20 20 19 19 19 19	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia Moldova Jordan Tunisia Turkey Chile	30 28 27 26 23 22 21 20 20 20 19 19 19 19 17 8	
United States Thailand Bulgaria Cyprus Latvia (LSS) Italy Romania Iran, Islamic Rep. Macedonia, Rep. of Malaysia Indonesia Moldova Jordan Tunisia Turkey Chile Morocco	30 28 27 26 23 22 21 20 20 20 19 19 19 19 17 8 7	0 0 0 0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower 🔻		

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Complete circuits

Bolb 1	Bulb 2
0	0
¢.	¢
afaminam foil	plastic spoon
Bulb 3	Bath 4
\square	(II)
ų į	ų į
6	
brass key	
Which of the bulbs will light?	
A. I only	
B. 2 and 3 only	
C. 1 and 3 only	
D. 1, 3 and 4 only	
E. 1, 2 and 3 only	

Overall Percent Correct

Hong Kong, SAR	84	
Russian Federation	82	
Belgium (Flemish)	81	
Chinese Taipei	80	
Singapore	79	
Israel	79	
Korea, Rep. of	78	
Netherlands	78	
Hungary	74	
Australia	73	
Malaysia	72	
Czech Republic	72	0
Slovak Republic	71	0
Jordan	70	0
Cyprus	69	0
Finland	68	0
Japan	68	0
Thailand	65	0
Slovenia	65	0
England	65	0
5		
Tunisia	65	0
Tunisia United States	65 64	0 0
United States	64	
	64	
United States International Averag	64 e 64	0
United States International Average New Zealand	64 e 64 64	0
United States International Average New Zealand Lithuania Canada	64 e 64 64 63	0 0 0 0
United States International Average New Zealand Lithuania	64 e 64 63 60	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania	64 e 64 63 60 57	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy	64 e 64 63 60 57 57	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania	64 e 64 63 60 57 57 57 56	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS)	64 e 64 63 60 57 57 56 56	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco	64 e 64 63 60 57 57 56 56 56 56	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile	64 64 63 60 57 57 56 56 56 56 52 50	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile Moldova	64 64 63 60 57 57 56 56 56 56 52 50 48	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile Moldova Macedonia, Rep. of	64 64 63 60 57 57 56 56 56 56 52 50 48 48	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile Moldova Macedonia, Rep. of Turkey	64 64 63 60 57 57 56 56 56 56 52 50 48 48 48	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile Moldova Macedonia, Rep. of Turkey Iran, Islamic Rep.	64 64 63 60 57 57 56 56 56 56 52 50 48 48 48 46 43	0 0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile Moldova Macedonia, Rep. of Turkey Iran, Islamic Rep. Philippines	64 64 63 60 57 57 56 56 56 56 56 52 50 48 48 48 46 43 42	0 0 0 0
United States International Average New Zealand Lithuania Canada Bulgaria Romania Italy Morocco Latvia (LSS) Indonesia Chile Moldova Macedonia, Rep. of Turkey Iran, Islamic Rep.	64 64 63 60 57 57 56 56 56 56 52 50 48 48 48 46 43	0 0 0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower V		

Correct Response:

С

51

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Balancing 10 and 5 liter buckets

A. 10 likers 3 litters
B. i0 liters 10 liters
C.
D. 10 liters 5 liters

Item Number: N09

Correct Response:

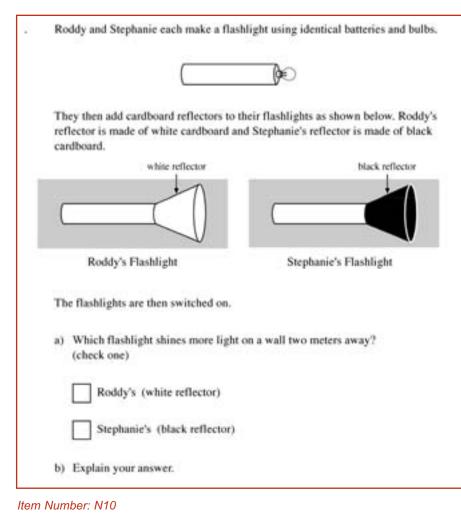
D

Japan	88	
Russian Federation	87	
Korea, Rep. of	87	
Finland	86	
Slovenia	84	
Chinese Taipei	84	
Netherlands	83	
Latvia (LSS)	82	
Czech Republic	82	
Hungary	81	
Australia	80	
Slovak Republic	80	
Thailand	78	
Lithuania	78	0
Canada	78	
Singapore	77	0
Belgium (Flemish)	77	0
New Zealand	77	0
Bulgaria	76	0
Malaysia	76	0
United States	73	0
Hong Kong, SAR	72	0
International Average	e 71	
Romania	70	0
England	70	0
Italy	69	0
Turkey	69	0
Indonesia	66	
Chile	63	
Moldova	62	
Macedonia, Rep. of	62	
Philippines	58	
Israel	56	▼
Tunisia	52	▼
Cyprus	50	▼
Iran, Islamic Rep.	47	
Morocco	34	▼
South Africa	33	▼

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

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Flashlights with white/black reflectors



SCORING

Note: A correct response must identify Roddy's and include an explanation based on the relative reflectivity of the white and black cardboard. Credit is given both for responses explicitly mentioning the higher reflectance of the white cardboard and/or the higher absorptance of the black cardboard as well as responses communicating this concept using less scientific terminology.

Correct Response

- Roddy's. With correct explanation based on the higher reflectivity of the white cardboard (or lower reflectivity/higher absorption of the black cardboard). [Explicitly refers to absorption and/or reflectivity.]
- Roddy's. Explanation based on the concept of higher reflectivity but using other terminology. [Does not explicitly refer to absorption/reflection properties.]
- Other correct.

Incorrect Response

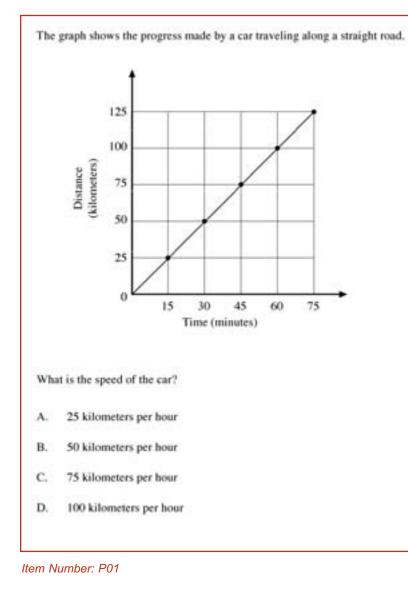
- Roddy's with an inadequate/incorrect or no explanation.
- Stephanie's. With or without explanation.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Chinese Taipei	59	
Singapore	58	
Russian Federation	57	
Malaysia	55	
England	54	
Hungary	52	
Netherlands	52	0
Belgium (Flemish)	51	
Japan	50	
Czech Republic	48	
Canada	47	
Lithuania	47	0
Australia	47	0
Slovenia	47	0
Bulgaria	45	0
United States	45	0
Finland	44	0
Korea, Rep. of	43	0
Jordan	43	0
Slovak Republic	42	0
New Zealand	41	0
Latvia (LSS)	41	0
Indonesia	40	0
Thailand	40	0
International Average	e 39	
Hong Kong, SAR	38	0
Macedonia, Rep. of	37	0
Tunisia	35	0
Italy	34	0
Turkey	32	
Cyprus	26	▼
Romania	25	
Israel	24	▼
Moldova	22	▼
Iran, Islamic Rep.	21	
Chile	17	
Morocco	16	0 V V V V V V V V
Philippines	12	▼
South Africa	11	▼

Country average vs. International average:		
Higher		
Not different	0	
Lower	•	

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Determination of speed from graph



Overall Percent Correct

Hong Kong, SAR	82	
Chinese Taipei	78	
Belgium (Flemish)	78	
Singapore	77	
Netherlands	75	
Malaysia	71	
Finland	71	
Australia	69	
Slovak Republic	69	
Canada	68	
Czech Republic	66	
Thailand	65	
Latvia (LSS)	62	0
Lithuania	62	0
Japan	61	0
New Zealand	60	0
Hungary	59	0
Slovenia	57	0
England	56	0
International Average	e 54	
Russian Federation	51	0
-		0 0
Russian Federation	51	
Russian Federation United States	51 50	0
Russian Federation United States Israel	51 50 49	0
Russian Federation United States Israel Tunisia	51 50 49 49	0 0 0 0
Russian Federation United States Israel Tunisia Moldova	51 50 49 49 47	0 0 0 0 0
Russian Federation United States Israel Tunisia Moldova Italy	51 50 49 49 47 47	
Russian Federation United States Israel Tunisia Moldova Italy South Africa	51 50 49 49 47 47 47	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria	51 50 49 49 47 47 47 47	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of	51 50 49 47 47 47 47 47 47 44	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania	51 50 49 47 47 47 47 47 44 42	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of	51 50 49 47 47 47 47 44 42 41	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus	51 50 49 47 47 47 47 44 42 41 41	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus Chile	51 50 49 47 47 47 47 47 44 42 41 41 37	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus Chile Turkey	51 50 49 47 47 47 47 47 42 41 41 37 36	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus Chile Turkey Morocco	51 50 49 47 47 47 47 47 42 41 41 37 36 34	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus Chile Turkey Morocco Jordan	51 50 49 47 47 47 47 47 42 41 41 37 36 34 32	
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus Chile Turkey Morocco Jordan Iran, Islamic Rep.	51 50 49 47 47 47 47 47 42 41 41 37 36 34 32 30	0 0 0 0 0
Russian Federation United States Israel Tunisia Moldova Italy South Africa Bulgaria Macedonia, Rep. of Romania Korea, Rep. of Cyprus Chile Turkey Morocco Jordan Iran, Islamic Rep. Indonesia	51 50 49 47 47 47 47 47 42 41 41 37 36 34 32 30 30	0 0 0 0 0 0

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

Correct Response:

D

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Amount of light on wall and ceiling

James turns on a flashlight in his bedroom and shines it on his wall one meter away to produce a small circle of light. He then shines the flashlight on his ceiling two meters away to produce a larger circle of light.

a) Does more light reach the ceiling than the wall? (Check one)

Yes
Yes

N	0
1.N	U

b) Explain your answer.

Item Number: P02

SCORING

Note: A correct response is based on the same amount of light reaching both the ceiling and the wall but being more spread out (less bright) on the ceiling. Correct responses must identify NO and include an explanation that states that the light is the same or that indicates that the light is just more spread out (less bright) on the ceiling without explicitly stating same. If the explanation merely repeats information that is in the stem, it is scored as incorrect even if NO is checked. If a response indicates that there is less light on the ceiling, the explanation must include a correct reason based on more air absorption/ scattering at a greater distance to be correct. Responses that indicate less light at a greater distance without further explanation should be scored as incorrect.

Correct Response

- No. Explains that the same amount of light reaches the wall and ceiling. (May also refer to light being more spread out on the ceiling or less concentrated/focused/bright).
- No. Explains (or shows in a diagram) that light is (only) more spread out (less bright) at a greater distance. (Does not explicitly state that the light is the same.)
- No. Explains that less light reaches the ceiling because of more air absorption/scattering at a greater distance.
- No. Other correct explanation.

Incorrect Response

- No. States that less light reaches the ceiling with inadequate explanation related to distance from source. (Does not include explanation of less light due to air absorption or scattering as in third correct response).
- No. Other incorrect/inadequate or no explanation. (Includes explanations that merely paraphrase the stem).
- Yes. Explanation based on light being bigger or more spread out.
- Yes. Other incorrect/inadequate or no explanation.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Chinese Taipei	52	
Hong Kong, SAR	40	
Korea, Rep. of	36	
Israel	36	
Australia	35	
Canada	35	
Singapore	34	
Cyprus	34	
Slovak Republic	32	0
Finland	32	0
Hungary	32	
United States	31	
Macedonia, Rep. of	31	0
Latvia (LSS)	30	0
New Zealand	29	0
England	29	0
Belgium (Flemish)	28	0
Netherlands	26	0
Slovenia	25	0
International Average	e 24	
Lithuania	24	0
		0 0
Lithuania	24	
Lithuania Czech Republic	24 23	0
Lithuania Czech Republic Thailand	24 23 22	0
Lithuania Czech Republic Thailand Iran, Islamic Rep.	24 23 22 22	0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria	24 23 22 22 20	0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova	24 23 22 22 20 20	0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation	24 23 22 22 20 20 20	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy	24 23 22 20 20 20 20 19	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan	24 23 22 20 20 20 20 19 19	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey	24 23 22 20 20 20 20 19 19 18	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia	24 23 22 20 20 20 19 19 18 14	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania	24 23 22 20 20 20 20 19 19 18 14 13	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania Tunisia	24 23 22 20 20 20 19 19 18 14 13 13	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania Tunisia Chile	24 23 22 20 20 20 19 19 18 14 13 13 12	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania Tunisia Chile Jordan	24 23 22 20 20 20 19 19 18 14 13 13 12 11	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania Tunisia Chile Jordan Malaysia South Africa	24 23 22 20 20 20 19 19 18 14 13 13 12 11 8 3	0 0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania Tunisia Chile Jordan Malaysia	24 23 22 20 20 20 19 19 18 14 13 13 12 11 8	0 0 0 0 0
Lithuania Czech Republic Thailand Iran, Islamic Rep. Bulgaria Moldova Russian Federation Italy Japan Turkey Indonesia Romania Tunisia Chile Jordan Malaysia South Africa Philippines	24 23 22 20 20 20 19 19 18 14 13 13 12 11 8 3 3	0 0 0 0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower	•	

Content Domain	Cognitive Domain
Physics	Understanding Complex Information

Appearance of red dress in green light

As a play begins, white stage lights shine on an actress wearing a red dress. Suddenly, the lights go off and a green light is shone on the actress. The dress looks black. Why does the dress look black?

- A. The dress reflects the green part of light.
- B. The dress absorbs the red part of light.
- C. The dress absorbs the green part of light.
- D. The dress reflects the black part of light.

Item Number: R02

Singapore 63

Overall Percent Correct

Singapore	63	
Hungary	57	
Japan	55	
Malaysia	53	
Korea, Rep. of	51	
Australia	49	
Netherlands	48	0
Slovenia	48	
United States	47	
Canada	45	
England	44	0
Chinese Taipei	44	0
Czech Republic	43	0
New Zealand	40	0
Russian Federation	39	0
Indonesia	38	0
Slovak Republic	38	0
International Average	e 37	
Belgium (Flemish)	36	0
Latvia (LSS)	35	0
Lithuania	35	0
Cyprus	35	0
		0 0
Cyprus	35 35 35	0 0 0
Cyprus Thailand	35 35	0 0 0
Cyprus Thailand Bulgaria	35 35 35	0 0 0 0
Cyprus Thailand Bulgaria Finland	35 35 35 35	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy	35 35 35 35 35	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel	35 35 35 35 35 35 33	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR	35 35 35 35 35 33 33 32	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile	35 35 35 35 35 33 32 29	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan	35 35 35 35 35 33 32 29 28	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova	35 35 35 35 33 32 29 28 28 28	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova Tunisia	35 35 35 35 33 32 29 28 28 28 28	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova Tunisia Macedonia, Rep. of	35 35 35 35 33 32 29 28 28 28 28 28 28 27	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova Tunisia Macedonia, Rep. of Iran, Islamic Rep.	35 35 35 35 33 32 29 28 28 28 28 28 28 27 26	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova Tunisia Macedonia, Rep. of Iran, Islamic Rep. Romania	35 35 35 35 33 29 28 28 28 28 28 28 28 27 26 24	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova Tunisia Macedonia, Rep. of Iran, Islamic Rep. Romania Philippines	35 35 35 35 33 29 28 28 28 28 28 28 27 26 24 23	0 0 0 0 0
Cyprus Thailand Bulgaria Finland Italy Israel Hong Kong, SAR Chile Jordan Moldova Tunisia Macedonia, Rep. of Iran, Islamic Rep. Romania Philippines Turkey	35 35 35 33 32 29 28 28 28 28 28 27 26 24 23 22	0 0 0 0

Country average vs. International average:		
Higher Not different Lower		

Correct Response:

С

56

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Conversion of electrical/light energy

Electrical energy is used to power a lamp. How does the amount of electrical energy used compare to amount of light energy produced?

a) The amount of electrical energy used is: (Check one)

more than the amount of light energy produced.

less than the amount of light energy produced.

the same as the amount of light energy produced.

b) Give a reason to support your answer.

Item Number: X01

SCORING

Note: A correct response must identify more and include a correct explanation based on electrical energy being converted to heat or a more general description of energy losses or low efficiency. Responses that include explanations based on heat, energy losses or low efficiency but with an incorrect application to the problem by checking less are scored as incorrect.

Correct Response

- MORE. With an explanation based on (much) energy being converted to heat.
- MORE. With other correct explanation of energy (power) loss or low efficiency. [Must clearly indicate that "some" energy goes elsewhere].
- MORE. Other correct explanation.

Incorrect Response

- MORE. Incorrect/inadequate or no explanation.
- SAME. Explanation is based on the concept of conservation of energy without considering energy losses.
- LESS. Explanation based on heat, energy losses or low efficiency but with an incorrect application.
- · LESS. Any other incorrect or no explanation.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

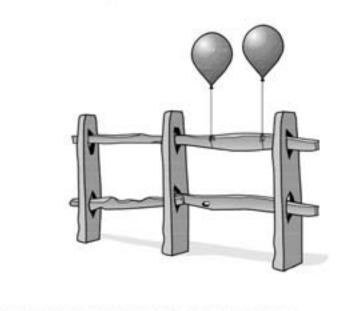
Singapore	21	
England	16	
Russian Federation	16	
Hungary	14	
Slovenia	13	
Chinese Taipei	12	
Hong Kong, SAR	12	
Belgium (Flemish)	11	
Macedonia, Rep. of	11	0
Iran, Islamic Rep.	10	0
Slovak Republic	10	0
Netherlands	10	0
Japan	10	0
Australia	9	0
Korea, Rep. of	8	0
Canada	8	0
Czech Republic	8	0
International Averag	e 8	
Bulgaria	7	0
New Zealand	7	0
Tunisia	6	0
Turkey	6	0
Finland	6	0
Latvia (LSS)	6	0
Lithuania	5	0
Italy	5	0
Israel	5	•
Romania	4	•
Cyprus	4	▼
United States	4	•
Jordan	4	•
Moldova	4	▼
Malaysia	3	•
Thailand	3	•
Morocco	3	
Indonesia	2	▼
South Africa	2	▼
Chile	1	▼
Philippines	0	▼

Country average vs. International average:		
Higher Not different Lower		

Content Domain	Cognitive Domain
Physics	Theorizing, Analyzing and Solving Problems

Heat expansion of balloons

Balloons filled with helium gas are taken outside on a hot, sunny day and tied to a fence as shown in the diagram.



Over a period of a few hours, the balloons increase in size. Explain why.

Item Number: Z03

SCORING

Note: A correct response is based on an increase in gas volume (or internal gas pressure) as a result of increased temperature. Credit is given for both higher-level responses relating to the increased kinetic energy of helium atoms as a function of temperature as well as more general responses relating to increased internal gas pressure and/or gas volume. An increase in temperature does not have to be explicitly mentioned in order to receive credit. Responses referring ONLY to the balloon expanding or to the effect of temperature on the balloon without further explanation of the gas behavior are scored as incorrect.

Correct Response

- Mentions explicitly that (as the gas in the balloon heats up), the helium (gas) atoms (particles, molecules) move faster (collide more frequently) causing the pressure inside the balloon to increase and/or the volume to increase (expand).
- Mentions that the pressure of the gas inside the balloon increases and/or the volume of the gas increases (expands). (No mention of gas atoms/molecules).
- Other correct.

Incorrect Response

- Mentions only that the sun heats the helium (gas) and/or causes the balloon to expand. [No reference to the pressure/volume changes in the gas.]
- Mentions pressure and/or volume with inadequate explanation.
- Mentions only the effect of heat (from Sun) on the balloon material (rubber, latex).
- · Refers to (individual) atoms or molecules expanding (or growing).
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Korea, Rep. of	50	
Finland	49	
Netherlands	46	
Singapore	46	
Lithuania	41	
Japan	37	
Australia	36	
Russian Federation	35	
Hungary	34	
New Zealand	33	
Thailand	33	
Chinese Taipei	33	
Czech Republic	33	0
Jordan	32	0
England	32	0
United States	31	0
Slovak Republic	30	0
Slovenia	30	0
Canada	28	0
Belgium (Flemish)	26	0
-) - ()		
International Averag		
		0
International Averag	e 26	0 0
International Averag Bulgaria	e 26 25	0 0
International Averag Bulgaria Latvia (LSS)	e 26 25 24	0 0 0
International Averag Bulgaria Latvia (LSS) Italy	e 26 25 24 24	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of	e 26 25 24 24 24 24	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia	e 26 25 24 24 24 24 21	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR	e 26 25 24 24 24 24 21 19	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania	e 26 25 24 24 24 24 21 19 17	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova	e 26 25 24 24 24 21 19 17 17	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia	e 26 25 24 24 24 21 19 17 17 16	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey	e 26 25 24 24 24 21 19 17 17 16 15	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey Israel	e 26 25 24 24 24 21 19 17 17 16 15 15	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey Israel Morocco	e 26 25 24 24 24 21 19 17 17 16 15 15 14	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey Israel Morocco Iran, Islamic Rep.	e 26 25 24 24 24 21 19 17 17 16 15 15 14 14	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey Israel Morocco Iran, Islamic Rep. Chile	e 26 25 24 24 24 21 19 17 17 16 15 15 14 14 6	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey Israel Morocco Iran, Islamic Rep. Chile Cyprus	e 26 25 24 24 24 21 19 17 17 16 15 15 14 14 6 6	0 0 0
International Averag Bulgaria Latvia (LSS) Italy Macedonia, Rep. of Malaysia Hong Kong, SAR Romania Moldova Tunisia Turkey Israel Morocco Iran, Islamic Rep. Chile Cyprus Indonesia	e 26 25 24 24 24 21 19 17 17 16 15 15 14 14 6 6 5	0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower	V	

Content Domain	Cognitive Domain
Chemistry	Understanding Simple Information

Best reason for painting iron surfaces

Paint applied to an iron surface prevents the iron from rusting. Which ONE of the following provides the best reason?

- A. It prevents nitrogen from coming in contact with the iron.
- B. It reacts chemically with the iron.
- C. It prevents carbon dioxide from coming in contact with the iron.
- D. It makes the surface of the iron smoother.
- E. It prevents oxygen and moisture from coming in contact with the iron.

Item Number: F06

Overall Percent Correct

Chinese Taipei	91	
Finland	83	
Russian Federation	81	
Hungary	81	
Singapore	81	
Netherlands	80	
Hong Kong, SAR	79	
Jordan	78	
England	76	
Bulgaria	76	
Iran, Islamic Rep.	76	
Lithuania	74	
Slovak Republic	73	
Korea, Rep. of	73	
Canada	72	0
Australia	72	0
Czech Republic	72	0
Romania	71	0
Thailand	70	0
Slovenia	70	0
Japan	70	0
Belgium (Flemish)	70	0
Latvia (LSS)	69	0
International Average	67	
New Zealand	66	0
United States	66	0
Israel	66	0
Malaysia	66	0
Italy	65	0
Macedonia, Rep. of	65	0
Chile	64	0
Cyprus	62	
Turkey	58	
Philippines	48	
Moldova	47	
Indonesia	47	
Tunisia	44	0 • • • •
South Africa	26	▼
Morocco	24	▼

Country average vs. International average:		
Higher Not different Lower		

Correct Response:

: | E

▲ 0 ▼

Country average vs. International average:

Higher Not different

Lower

Content Domain	Cognitive Domain		
Chemistry	Understanding Simple Information		
urning wood absorbs/releases	energy	Overall Percen	it Cor
If you are burning wood, the rea	action will	Chinese Taipei	82
ii you are burning wood, the rea		Hungary	77
		Finland	75
A. release energy		Macedonia, Rep. of	74
		Hong Kong, SAR	70
B. absorb energy		England	68
D. abborb energy		Singapore	68
~		Iran, Islamic Rep.	66
C. neither absorb nor release er	nergy	Canada	66
		Korea, Rep. of	65
D. sometimes release and some	imes absorb energy	Russian Federation	65
		Malaysia	65
depending on the kind of woo	d d	United States	64
		Netherlands	64
		Bulgaria	63
		Belgium (Flemish)	61
		Lithuania	61
		Japan	59
		Israel	58
		Australia	58
		Turkey	58
		New Zealand	58
		Slovenia	57
		International Averag	e 55
		Italy	54
		Cyprus	54
		Slovak Republic	54
		Moldova	53
		Jordan	51
		Czech Republic	47
		Romania	46
		Thailand	43
		Latvia (LSS)	40
		Indonesia	36
		Chile	33
		Philippines	30
		Tunisia	25
em Number: H06		South Africa	20

Correct Response: Α

Content Domain	Cognitive Domain
Chemistry	Understanding Complex Information

Compounds, molecules and atoms

The words *organs, tissues*, and *cells* can be used in the following sentence:

Lungs are *organs* composed of *tissues* which are made up of *cells*.

Use the words *molecules*, *atoms*, and *compounds* to complete the following sentence:

Sugars are _____ composed of _____ which are made up of

Item Number: J03

SCORING

Correct Response

• Compounds - Molecules - Atoms

Incorrect Response

- Compounds Atoms Molecules
- Molecules Atoms Compounds

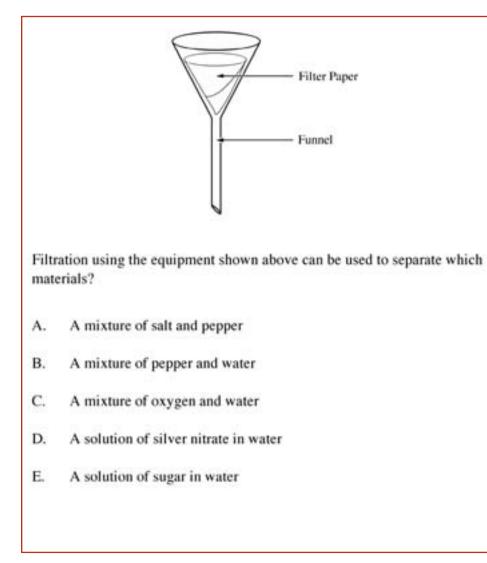
• Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Singapore	69	
Bulgaria	67	
Slovak Republic	65	
Japan	63	
Russian Federation	61	
Korea, Rep. of	60	
Czech Republic	60	
Chinese Taipei	57	
Macedonia, Rep. of	56	
Italy	55	
Lithuania	54	0
Slovenia	54	0
Malaysia	53	
Australia	53	0
Latvia (LSS)	52	0
Canada	51	0
United States	51	0
England	49	0
Moldova	48	0
Iran, Islamic Rep.	46	0
Hungary	46	0
International Average	e 46	
international Average	- 40	
Finland	44	0
		0 0
Finland	44	0 0
Finland Israel	44 43	0 0 0
Finland Israel Netherlands	44 43 42	0 0 0
Finland Israel Netherlands Belgium (Flemish)	44 43 42 41	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand	44 43 42 41 41	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines	44 43 42 41 41 41	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile	44 43 42 41 41 41 39	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR	44 43 42 41 41 41 39 38	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan	44 43 42 41 41 41 39 38 36	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan Romania	44 43 42 41 41 39 38 36 33	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan Romania Indonesia	44 43 42 41 41 39 38 36 33 30	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan Romania Indonesia Thailand	44 43 42 41 41 41 39 38 36 33 30 30	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan Romania Indonesia Thailand Cyprus	44 43 42 41 41 39 38 36 33 30 30 29	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan Romania Indonesia Thailand Cyprus Tunisia	44 43 42 41 41 39 38 36 33 30 30 29 27	0 0 0
Finland Israel Netherlands Belgium (Flemish) New Zealand Philippines Chile Hong Kong, SAR Jordan Romania Indonesia Thailand Cyprus Tunisia Turkey	44 43 41 41 39 38 36 33 30 30 29 27 23	0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower	▼	

Content Domain	Cognitive Domain
Chemistry	Using Tools, Routine Procedures and Science Processes

Filtration of mixtures



Item Number: L06

Correct Response: B

Czech Republic	64	
Slovak Republic	62	
Lithuania	54	
Finland	54	
Latvia (LSS)	53	
Hungary	52	
Korea, Rep. of	51	
Russian Federation	50	
Canada	50	
Singapore	50	
Slovenia	48	
Netherlands	48	0
Chinese Taipei	46	
Romania	42	0
Japan	42	0
Malaysia	42	0
Australia	41	0
New Zealand	39	0
International Averag	e 39	
United States	39	0
officed states	55	0
Cyprus	39	0
		0
Cyprus	39	0 0 0
Cyprus Hong Kong, SAR	39 38	0 0 0
Cyprus Hong Kong, SAR Bulgaria	39 38 37	0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova	39 38 37 34	0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England	39 38 37 34 34	
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia	39 38 37 34 34 34	
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish)	39 38 37 34 34 34 34 33	
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel	39 38 37 34 34 34 34 33 32	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy	 39 38 37 34 34 34 34 33 32 30 	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand	39 38 37 34 34 34 33 32 30 30	0 0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey Macedonia, Rep. of	 39 38 37 34 34 34 33 32 30 30 29 	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey	 39 38 37 34 34 34 33 32 30 30 29 28 	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey Macedonia, Rep. of	 39 38 37 34 34 34 32 30 30 29 28 27 	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey Macedonia, Rep. of South Africa Jordan Chile	 39 38 37 34 34 33 32 30 30 29 28 27 27 24 21 	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey Macedonia, Rep. of South Africa Jordan Chile Iran, Islamic Rep.	 39 38 37 34 34 33 32 30 30 29 28 27 27 24 21 19 	0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey Macedonia, Rep. of South Africa Jordan Chile	 39 38 37 34 34 33 32 30 30 29 28 27 27 24 21 19 15 	0 0 0 0 0 0 0
Cyprus Hong Kong, SAR Bulgaria Moldova England Tunisia Belgium (Flemish) Israel Italy Thailand Philippines Turkey Macedonia, Rep. of South Africa Jordan Chile Iran, Islamic Rep.	 39 38 37 34 34 33 32 30 30 29 28 27 27 24 21 19 	0 0 0 0 0

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

Content Domain	Cognitive Domain
Chemistry	Understanding Simple Information

Example of chemical reaction

Chinese Taipei	87	
Japan	76	
Hong Kong, SAR	72	
England	66	
Singapore	64	
Netherlands	64	
Russian Federation	60	
Korea, Rep. of	59	
Iran, Islamic Rep.	58	
Malaysia	57	
Finland	56	0
Hungary	56	0
Canada	55	0
Bulgaria	54	0
Jordan	54	0
Slovenia	54	0
Australia	53	0
Romania	52	0
United States	52	0
International Average	e 49	
Belgium (Flemish)	49	0
Thailand	49	0
Italy	48	0
Latvia (LSS)	47	0
Czech Republic	47	0
Slovak Republic	47	0
New Zealand	42	0
Macedonia, Rep. of	40	
Cyprus	40	▼
Chile	37	▼
Lithuania	~ -	
Litilaama	37	
Indonesia	37 35	•
		• •
Indonesia Moldova	35	• • •
Indonesia	35 34	* * * *
Indonesia Moldova Turkey Israel	35 34 32	* * * *
Indonesia Moldova Turkey	35 34 32 31	* * * * *
Indonesia Moldova Turkey Israel Philippines	35 34 32 31 30	* * * * *
Indonesia Moldova Turkey Israel Philippines Morocco	35 34 32 31 30 30	* * * * * * * * * * * * * * * * * * *
Indonesia Moldova Turkey Israel Philippines Morocco Tunisia	35 34 32 31 30 30 23	* * * * *
	Japan Hong Kong, SAR England Singapore Netherlands Russian Federation Korea, Rep. of Iran, Islamic Rep. Malaysia Finland Hungary Canada Bulgaria Jordan Slovenia Australia Romania United States International Averag Belgium (Flemish) Thailand Italy Latvia (LSS) Czech Republic Slovak Republic Slovak Republic New Zealand Macedonia, Rep. of Cyprus	Japan 76 Hong Kong, SAR 72 England 66 Singapore 64 Netherlands 64 Russian Federation 60 Korea, Rep. of 59 Iran, Islamic Rep. 58 Malaysia 57 Finland 56 Hungary 56 Canada 55 Bulgaria 54 Jordan 54 Australia 53 Romania 52 United States 52 International Average 49 Italy 48 Latvia (LSS) 47 Slovak Republic 47 Slovak Republic 42 Macedonia, Rep. of 40

Overall Percent Correct

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

Which is an example of a chemical reaction?

- A. Water boiling
- B. Sugar dissolving
- C. Nails rusting
- D. Wax melting

Item Number: N07

Correct Response: С

Content Domain	Cognitive Domain
Chemistry	Theorizing, Analyzing and Solving Problems

Small pieces of wood burn faster

A large log of wood will burn more slowly than the same log chopped into smaller pieces. Explain why.

Item Number: R05

SCORING

Note: A correct response is based on the concept of increased surface area in the smaller pieces resulting in faster burning (reaction with oxygen). Credit is given both for higher-level responses indicating increased availability of oxygen/air or surface area in the chopped wood pieces as well as less sophisticated responses describing only that more wood is exposed to the flame and can, therefore, burn simultaneously.

Correct Response

- Mentions that there is more wood (surface area) in contact with oxygen or air in the smaller pieces. [Explicitly mentions availability to oxygen/air.]
- Mentions effect of increased surface area in the chopped wood pieces. [Explicitly mentions surface area, surface, or area. No mention of oxygen/air.]
- Mentions that when chopped, more parts of the wood are exposed to flame (ignite, catch fire) and all the small pieces can burn simultaneously. [No explicit mention of oxygen/air or surface area.]
- Other correct.

Incorrect Response

- Refers only to relative rates of burning (burning through). [Does not refer explicitly to surface area, oxygen/air, or simultaneous burning.]
- Refers only to the relative rate of ignition (catching on fire, heating up). [Does not refer explicitly to surface area, oxygen/air, or simultaneous burning.]
- Mentions only the need for oxygen/air. [Incorrect/inadequate or no connection to increased availability in chopped wood.]
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Slovak Republic	53	
Moldova	53	
Chinese Taipei	50	
Finland	39	
Russian Federation	33	0
Hungary	32	
Latvia (LSS)	32	0
Slovenia	31	0
Macedonia, Rep. of	31	0
Netherlands	30	0
New Zealand	30	0
England	30	0
Bulgaria	29	0
Australia	29	0
Czech Republic	29	0
Belgium (Flemish)	28	0
Korea, Rep. of	28	0
Singapore	27	0
Iran, Islamic Rep.	25	0
International Average	e 24	
Canada	23	0
Canada Indonesia		0 0
	23	0 0
Indonesia	23 23	0 0 0
Indonesia Malaysia	23 23 21	0 0 0
Indonesia Malaysia Romania	23 23 21 21	0 0 0
Indonesia Malaysia Romania Lithuania	23 23 21 21 20	0 0 0
Indonesia Malaysia Romania Lithuania Jordan	23 23 21 21 20 18	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States	23 23 21 21 20 18 18	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel	23 23 21 21 20 18 18 18 17	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey	23 23 21 20 18 18 17 15	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR	23 23 21 20 18 18 17 15 14	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy	23 21 21 20 18 18 17 15 14 13	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus	23 21 21 20 18 18 17 15 14 13 13	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus Thailand	23 21 21 20 18 18 17 15 14 13 13 13	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus Thailand Philippines Chile Tunisia	23 21 21 20 18 18 17 15 14 13 13 13 10	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus Thailand Philippines Chile	23 21 21 20 18 18 17 15 14 13 13 13 10 9	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus Thailand Philippines Chile Tunisia	23 21 21 20 18 17 15 14 13 13 13 10 9 9	0 0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus Thailand Philippines Chile Tunisia South Africa	23 21 21 20 18 18 17 15 14 13 13 13 10 9 9 7	0 0
Indonesia Malaysia Romania Lithuania Jordan United States Israel Turkey Hong Kong, SAR Italy Cyprus Thailand Philippines Chile Tunisia South Africa Japan	23 21 21 20 18 18 17 15 14 13 13 10 9 9 7 5	0 0 0

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

Content Domain	Cognitive Domain
Chemistry	Theorizing, Analyzing and Solving Problems

Galvanization of steel

A steel manufacturer uses a chemical process called 'galvanization' to protect the surface of steel beams that are used to construct high-rise buildings. It takes a crew of steel workers 8 hours to 'galvanize' a large batch of steel.

a) Why MUST the surface of the steel be protected?

b) A new 'galvanization' process is developed that shortens the procedure to 4 hours. Describe two consequences of the steel manufacturer switching to the shorter 'galvanization' process.

1.

2.

Item Number: Z01A

SCORING

A: Scoring for why steel is galvanized

Note: A correct response must explicitly reference rusting, corrosion, oxidation, or comparable term.

Correct Response

• Explicitly refers to rusting, corrosion, or oxidation.

Incorrect Response

- Mentions only the general structural properties of steel (hardness, strength, durability, etc.). [No mention of rusting, corrosion, oxidation, or equivalent].
- Mentions protection from weather, water, air, etc. [No mention of rusting, oxidation, corrosion, or equivalent.]
- Mentions only protecting the surface (repeats information in stem).
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Chinese Taipei	77	
Singapore	66	
Korea, Rep. of	63	
England	57	
Finland	56	
Australia	56	
Canada	56	
Hong Kong, SAR	56	
Hungary	54	
Belgium (Flemish)	54	
Slovak Republic	48	
New Zealand	48	
United States	46	
Malaysia	46	
Jordan	44	0
Thailand	43	0
Slovenia	40	0
Czech Republic	38	0
Japan	38	0
International Average	e 37	
international Average	e 37	
Bulgaria	e 37 35	0
		0
Bulgaria	35	0
Bulgaria Romania	35 32	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands	35 32 32	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy	35 32 32 31	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands	35 32 32 31 31	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS)	35 32 32 31 31 29	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation	35 32 31 31 29 28	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia	35 32 31 31 29 28 28	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep.	35 32 31 31 29 28 28 28 27	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia	35 32 31 31 29 28 28 27 24 23 21	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel	35 32 31 31 29 28 28 27 24 23	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel Turkey	35 32 31 31 29 28 28 27 24 23 21	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel Turkey Cyprus	35 32 31 31 29 28 28 27 24 23 21 20	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel Turkey Cyprus Chile Lithuania Moldova	35 32 31 31 29 28 27 24 23 21 20 16	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel Turkey Cyprus Chile Lithuania	35 32 31 31 29 28 28 27 24 23 21 20 16 16	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel Turkey Cyprus Chile Lithuania Moldova	35 32 31 31 29 28 28 27 24 23 21 20 16 16 11	0 0 0
Bulgaria Romania Macedonia, Rep. of Italy Netherlands Latvia (LSS) Russian Federation Indonesia Iran, Islamic Rep. Tunisia Israel Turkey Cyprus Chile Lithuania Moldova Philippines	35 32 31 31 29 28 28 27 24 23 21 20 16 16 11 10	0



Content Domain	Cognitive Domain
Chemistry	Theorizing, Analyzing and Solving Problems

Galvanization of steel

A steel manufacturer uses a chemical process called 'galvanization' to protect the surface of steel beams that are used to construct high-rise buildings. It takes a crew of steel workers 8 hours to 'galvanize' a large batch of steel.

a) Why MUST the surface of the steel be protected?

b) A new 'galvanization' process is developed that shortens the procedure to 4 hours. Describe two consequences of the steel manufacturers switching to the shorter 'galvanization' process.

1.

2.

Item Number: Z01D

SCORING

B: Scoring for new process

Correct Response

- Mentions that there is more profit (or lower cost) for the manufacturing company.
- Mentions greater efficiency/productivity or that more steel/buildings can be produced (faster).
- · Mentions unemployment or lower pay for workers.
- · Mentions any other worker-related consequence.
- Mentions that the new method might be inferior to the old (shorter process saves time at the expense of quality; unproven method compared to old reliable one).
- Other correct.

Incorrect Response

• Mentions only that the new process is shorter or takes 4 hours (less time). [Merely reports information given in stem.]

Korea, Rep. of	45	
Netherlands	42	
Singapore	41	
Canada	37	
Japan	36	
Thailand	35	
Finland	34	
Belgium (Flemish)	32	
New Zealand	31	
Slovak Republic	30	
Australia	27	
England	26	0
United States	26	
Hungary	25	0
Hong Kong, SAR	22	0
Chinese Taipei	21	0
Slovenia	21	0
Malaysia	20	0
International Averag	e 20	
Bulgaria	18	0
Latvia (LSS)	17	0
	17 16	0 0
Latvia (LSS)		0 0 0
Latvia (LSS) Czech Republic	16	0 0 0
Latvia (LSS) Czech Republic Jordan	16 15	0 0 V V
Latvia (LSS) Czech Republic Jordan Israel	16 15 13	0 0 V V
Latvia (LSS) Czech Republic Jordan Israel Tunisia	16 15 13 13	0 0 V V
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy	16 15 13 13 12	0 0 V V V
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus	16 15 13 13 12 11	0 0 V V V V
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of	16 15 13 13 12 11 11	0 0 * * *
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania	16 15 13 13 12 11 11 11	0 0 7 7 7 7 7 7 7
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey	16 15 13 13 12 11 11 11 11	0 0 * * * * *
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia	16 15 13 12 11 11 11 10 9	0 0 7 7 7 7 7 7 7 7 7 7
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia Moldova	16 15 13 12 11 11 11 10 9 8	0 0 7 7 7 7 7 7 7 7 7 7 7
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia Moldova Chile	16 15 13 12 11 11 10 9 8 7 7 5	
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia Moldova Chile Romania	16 15 13 12 11 11 10 9 8 7 7 5 3	
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia Moldova Chile Romania Russian Federation	16 15 13 12 11 11 11 10 9 8 7 7 5 3 3 3	0 0 * * * * * * * * * *
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia Moldova Chile Romania Russian Federation South Africa	16 15 13 12 11 11 10 9 8 7 7 5 3	
Latvia (LSS) Czech Republic Jordan Israel Tunisia Italy Cyprus Macedonia, Rep. of Lithuania Turkey Indonesia Moldova Chile Romania Russian Federation South Africa Philippines	16 15 13 12 11 11 11 10 9 8 7 7 5 3 3 3	

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

Cal	ntant	main
60	пеп	IIIdIII

Cognitive Domain

Environmental and Resource Issues **Understanding Complex** Information

Area where soil is washed away

Rain and running water can wash away soil. From which area is soil most likely to be washed away?

- A. A sloping area with bushes
- B. A flat area with grasses
- C. A flat area that is barren
- D. A sloping area that is barren

Item Number: F04

Correct Response:

D

Chinese Taipei	92	
Singapore	88	
Slovak Republic	85	
Hong Kong, SAR	85	
Netherlands	83	
Korea, Rep. of	83	
Malaysia	81	
Russian Federation	80	
Japan	79	
England	78	
Australia	78	
Canada	76	
Cyprus	76	
Latvia (LSS)	75	
Slovenia	75	
Tunisia	74	
Czech Republic	73	0
Indonesia	73	
United States	73	0
New Zealand	71	0
Hungary	70	0
Thailand	69	0
Belgium (Flemish)	68	0
Finland	68	0
International Average		
Lithuania	66	0
Jordan	65	0
Romania	65	0
Israel	63	0
Italy	59	
Macedonia, Rep. of	55	
Bulgaria	52	▼
Chile	52	
Moldova	50	
Turkey	49	
Iran, Islamic Rep.	44	0 V V V V V V V V
Morocco	42	▼
Philippines	39	
South Africa	26	

Country average vs. International average:		
Higher Not different Lower		

Content Dom	ain
	alli

Cognitive Domain

Environmental and Resource Issues

Understanding Complex Information

Effectiveness of insecticides

Insecticides are used to control insect populations so that they do not destroy crops. Over time, some insecticides become less effective at killing insects, and new insecticides must be developed. What is the most likely reason insecticides become less effective over time?

- A. Surviving insects have learned to include insecticides as a food source.
- B. Surviving insects pass their resistance to insecticides to their Soffspring.
- C. Insecticides build up in the soil.
- D. Insecticides are concentrated at the bottom of the food chain.

Item Number: L07

Correct Response: B

Chinese Taipei	76	
Hong Kong, SAR	74	
Hungary	70	
Singapore	69	
Japan	68	
Australia	66	
United States	62	
Netherlands	61	
Canada	60	
Russian Federation	60	0
Finland	57	0
Slovenia	57	0
Czech Republic	57	0
England	56	0
New Zealand	56	0
Belgium (Flemish)	53	0
Lithuania	51	0
Israel	51	0
Bulgaria	50	0
Italy	50	0
italy	50	
Thailand	49	0
,	49	0
Thailand International Average Romania	49	0
Thailand International Average	49 48 48 47	0
Thailand International Average Romania Korea, Rep. of Slovak Republic	49 48 48	0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of	49 48 48 47	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic	49 48 48 47 45	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey	49 48 48 47 45 43	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova	49 48 48 47 45 43 42	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS)	49 48 48 47 45 43 42 38	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile	49 48 48 47 45 43 42 38 38 38 38 38 37	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS)	49 48 48 47 45 43 42 38 38 38 38	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of	49 48 48 47 45 43 42 38 38 38 38 38 37	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of Philippines	49 48 48 47 45 43 42 38 38 38 38 38 37 33	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of Philippines Jordan	49 48 48 47 45 43 42 38 38 38 38 38 37 33 32	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of Philippines Jordan Cyprus	 49 48 47 45 43 42 38 38 37 33 32 31 27 25 	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of Philippines Jordan Cyprus Indonesia	 49 48 47 45 43 42 38 38 37 33 32 31 27 	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of Philippines Jordan Cyprus Indonesia South Africa	 49 48 47 45 43 42 38 38 37 33 32 31 27 25 	0 0 0 0 0 0 0 0 0 0 0
Thailand International Average Romania Korea, Rep. of Slovak Republic Turkey Moldova Iran, Islamic Rep. Chile Latvia (LSS) Macedonia, Rep. of Philippines Jordan Cyprus Indonesia South Africa Malaysia	 49 48 47 45 43 42 38 38 38 37 33 32 31 27 25 24 	0 0 0 0 0 0 0

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

Content Domain	Cognitive Domain
Environmental	Understanding Complex
and Resource Issues	Information

Two reasons for famine

What are two reasons why famine (a great shortage of food) occurs?

1.

2.

Item Number: P05D

SCORING

Note: Each of the two reasons must be scored separately. The same score can be used twice. However, if the reasons described are essentially the same, or an extension of the same idea, or if only one reason is given, the second reason should be scored as incorrect.

Correct Response

- Mentions agriculturally-related factors (soil depletion, overgrazing, erosion, poor farming techniques).
- Mentions natural disasters or weather-related factors (floods, earthquakes, rain distribution, drought, temperature, sun, etc.).
- Mentions crop disease, insect infestation or other pests.
- Mentions overpopulation or consumption.
- Mentions specific social/economic/political factors.
- Mentions pollution or other contamination.
- · Other correct.

Incorrect Response

- Mentions ONLY a lack or need of food (or other responses related to a general definition of famine).
- Response too vague.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Singapore	73	
Slovenia	72	
Slovak Republic	70	
Hong Kong, SAR	66	
Chinese Taipei	66	
Moldova	59	
Finland	55	
Australia	55	
Belgium (Flemish)	54	0
Canada	53	
Thailand	52	
New Zealand	48	0
Latvia (LSS)	47	0
Jordan	46	0
Czech Republic	44	0
Cyprus	43	0
International Avera	ige 42	
Turkey	42	0
Bulgaria	41	0
Italy	41	0
England	41	0
Malaysia	40	0
Netherlands	39	0
Korea, Rep. of	39	0
Japan	39	0
Russian Federation	38	0
Chile	37	0
United States	36	0
Indonesia	34	▼
Israel	33	▼
Iran, Islamic Rep.	33	
Romania	32	▼
Hungary	31	
Tunisia	29	
Lithuania	26	
Morocco	25	
Philippines	16	
Macedonia, Rep. of	14	
South Africa	8	

Country average vs. International average:		
Higher		
Not different	0	
Lower	V	

Content Domain	Cognitive Domain
Environmentel	Linderstanding Simple

Environmental and Resource Issues Understanding Simple Information

Result of global warming

A. Rising ocean level
B. More severe earthquakes
C. Larger volcanic eruptions
D. Thinning ozone layer

What is predicted to be a result of global warming?

Item Number: R06

Correct Response: A

Japan	67	
Hong Kong, SAR	59	
Chinese Taipei	58	
Lithuania	57	
Singapore	56	
Australia	52	
Bulgaria	49	
Italy	48	
Korea, Rep. of	47	
Hungary	44	
New Zealand	43	
Cyprus	42	
Slovak Republic	42	0
Russian Federation	38	0
South Africa	37	0
Latvia (LSS)	35	0
International Average	e 33	
England	33	0
Belgium (Flemish)	33	0
Netherlands	33	0
Czech Republic	32	0
Canada	31	0
Finland	31	0
United States	30	0
Moldova	29	0
Slovenia	28	0
Macedonia, Rep. of	25	
Israel	23	
Romania	22	
Morocco	22	
Jordan	20	
Malaysia	18	
Chile	16	
Philippines	16	
Turkey	15	
Thailand	13	
Tunisia	11	▼
Indonesia	10	 * *<
Iran, Islamic Rep.	9	
L		

Country avera International av	-
Higher Not different Lower	

Content	Domain

Cognitive Domain

Scientific Inquiry and the Nature of Science

Investigating the Natural World

Evaporation of vinegar and oil

Two open bottles, one filled with vinegar and the other with olive oil, were left on a window sill in the Sun. Several days later it was observed that the bottles were no longer full. What can be concluded from this observation?

- A. Vinegar evaporates faster than olive oil.
- B. Olive oil evaporates faster than vinegar.
- C. Both vinegar and olive oil evaporate.
- D. Only liquids containing water evaporate.
- E. Direct sunlight is needed for evaporation.

Item Number: N04

Overall Percent Correct

England	78	
Singapore	78	
Netherlands	76	
United States	76	
Australia	70	
Israel	67	
New Zealand	67	
Hungary	64	
Canada	64	
Korea, Rep. of	59	
Japan	50	0
Italy	49	0
Jordan	49	0
Belgium (Flemish)	49	0
Hong Kong, SAR	49	0
Czech Republic	49	0
International Average	48	
Malaysia	46	0
Bulgaria	45	0
Finland	45	0
Macedonia, Rep. of	44	0
Chinese Taipei	44	0
Indonesia	42	0
Iran, Islamic Rep.	42	0
Turkey	41	▼
Latvia (LSS)	41	0
Slovak Republic	40	0
Lithuania	39	0
Slovenia	39	\bullet
Morocco	38	
Philippines	38	•
Chile	38	•
Cyprus	36	•
Romania	30	
South Africa	29	•
Russian Federation	29	
Thailand	28	▼
Tunisia	27	* * * * * * * *
Moldova	19	▼

Country avera International a	-
Higher	▲
Not different	○
Lower	▼

Correct Response:

С

71

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CO	ntent	Dom	ain

Scientific Inquiry and the Nature of Science **Cognitive Domain**

Understanding Simple Information

Replication of measurements

The primary reason scientists repeat the measurements they take during experiments is so that they can

- A. check that the equipment is working
- B. list all the results in a table
- C. estimate experimental error
- D. change the experimental conditions

Item Number: P07

Correct Response:

С

Korea, Rep. of	87	
Chinese Taipei	73	
Japan	61	
Thailand	60	
Israel	57	
Hong Kong, SAR	56	
Lithuania	52	
Turkey	51	
Slovak Republic	50	
Latvia (LSS)	46	0
Singapore	46	0
Czech Republic	46	0
Finland	45	0
Romania	44	0
Bulgaria	43	0
Slovenia	43	0
Russian Federation	41	0
International Average	e 40	
United States	39	0
Moldova	39	0
Tunisia	35	0
England	35	0
Jordan	34	0
Canada	34	0
Chile	33	•
Chile Australia	33 33	•
		•
Australia	33	• • •
Australia Macedonia, Rep. of Hungary	33 32	* * *
Australia Macedonia, Rep. of	33 32 31	* * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish)	33 32 31 31	* * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands	33 32 31 31 30	* * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand Indonesia	33 32 31 31 30 29	* * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand	33 32 31 31 30 29 29	* * * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand Indonesia Philippines Iran, Islamic Rep.	33 32 31 31 30 29 29 29	* * * * * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand Indonesia Philippines	33 32 31 31 30 29 29 29 29 29	* * * * * * * * * * * * * * * * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand Indonesia Philippines Iran, Islamic Rep. Cyprus	33 32 31 31 30 29 29 29 29 29 28	* * * * * * * * * * * * * * * * * * *
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand Indonesia Philippines Iran, Islamic Rep. Cyprus Malaysia Italy	33 32 31 30 29 29 29 29 29 28 28 26	• • • • • • • • • • • • • • • • • • •
Australia Macedonia, Rep. of Hungary Belgium (Flemish) Netherlands New Zealand Indonesia Philippines Iran, Islamic Rep. Cyprus Malaysia	33 32 31 31 30 29 29 29 29 29 29 28 26 24	

Country average International av	-
Higher	▲
Not different	○
Lower	▼

Content Domain	Cognitive Domain
Scientific Inquiry and the Nature of Science	Investigating the Natural World

Bacteria/mold experiment

Alexander Fleming noticed that bacteria growing on a plate of agar did not grow next to a mold that was growing on the same plate. He wrote in his laboratory report: "The mold may be producing a substance that kills bacteria." This statement is best described as

- A. an observation
- B. a hypothesis
- C. a generalization
- D. a conclusion

Item Number: R01

Correct Response: B

Overall	Percent	Correct
Overan	I GIUGIII	ouneur

Chinese Taipei	80	
Japan	70	
Italy	67	
Israel	63	
Bulgaria	58	
Thailand	55	
Canada	52	
United States	47	
Hungary	42	0
Chile	42	
Netherlands	42	0
Morocco	41	0
Lithuania	41	0
Australia	39	0
Belgium (Flemish)	36	0
Tunisia	36	0
Cyprus	36	0
International Averag	e 35	
New Zealand	32	0
New Zealand Slovenia	32 32	0
		0
Slovenia	32	0
Slovenia Hong Kong, SAR	32 32	0 0 0
Slovenia Hong Kong, SAR Slovak Republic	32 32 30	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa	32 32 30 29	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore	32 32 30 29 28	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of	32 32 30 29 28 25	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep.	32 32 30 29 28 25 25	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan	32 32 30 29 28 25 25 25 22	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of	32 32 30 29 28 25 25 25 22 22	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of England	32 32 30 29 28 25 25 25 22 22 22 19	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of England Malaysia	32 32 30 29 28 25 25 22 22 22 19 18	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of England Malaysia Philippines	32 32 30 29 28 25 25 22 22 19 18 18	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of England Malaysia Philippines Latvia (LSS)	32 32 30 29 28 25 25 22 22 19 18 18 18	0 0 0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of England Malaysia Philippines Latvia (LSS) Romania Indonesia Finland	32 32 30 29 28 25 25 22 22 19 18 18 18 16 14	0
Slovenia Hong Kong, SAR Slovak Republic South Africa Singapore Korea, Rep. of Iran, Islamic Rep. Jordan Macedonia, Rep. of England Malaysia Philippines Latvia (LSS) Romania Indonesia	32 32 30 29 28 25 25 22 22 19 18 18 16 14 11	0 0 0

Country average vs. International average:		
Higher		
Not different	0	
Lower		

Content Domain	Cognitive Domain
Scientific Inquiry and the Nature of Science	Investigating the Natural World

Heart rate experiment design

Suppose you want to investigate how long it takes for the heart rate to return to normal after exercising. What materials would you use and what procedures would you follow?

Item Number: X03

SCORING

Note: A fully correct procedure may or may not include a separate materials list in order to receive full credit. If a materials list is not included, then time measurements must be explicitly referenced within the procedure (e.g. 'time how long it takes'). Partial credit is given for responses where one of the criteria for a correct response is not completely satisfied.

Correct Response

• Describes a procedure in which: i) Somebody (or self) measures "normal" pulse or heart rate at rest (using a timer or watch). ii) Subject does an exercise (physical activity). iii) The time interval is measured from completion of exercise until pulse rate returns to "normal".

• Other fully correct.

Partial Response

- · As in correct response, but no mention of beginning ('normal') pulse measurement.
- As in correct response, but no mention of measuring the time interval after exercise until pulse returns to normal.
- · Other partially correct with one criterion not completely satisfied.

Incorrect Response

- No procedure given; only mentions materials.
- Describes a minimal procedure not satisfying two or more of the criteria stated in correct response.
- Refers only to how to measure the heart (pulse) rate.
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Singapore	32	
England	31	
Australia	30	
Korea, Rep. of	30	
New Zealand	28	
Canada	26	
Chinese Taipei	24	
Belgium (Flemish)	23	
United States	21	
Hong Kong, SAR	20	
Netherlands	20	0
Japan	19	
Czech Republic	19	
Finland	17	
International Average	e 12	
Hungary	11	0
Israel	9	▼
Slovak Republic	8	▼
Slovenia	8	▼
Macedonia, Rep. of	7	▼
Latvia (LSS)	7	▼
Italy	6	▼
Cyprus	6	•
Lithuania	6	•
Russian Federation	6	▼
Jordan	5	•
Indonesia	5	•
Turkey	4	•
Thailand	4	•
Moldova	4	•
Romania	3	•
Bulgaria	3	▼
Chile	2	•
Malaysia	2	•
Morocco	2	•
Tunisia	2	▼
Philippines	2	•
Iran, Islamic Rep.	2	
South Africa	1	▼

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