Trends in International Mathematics and Science Study (TIMSS)

Released Science Items

Teaching Resource Pack in Science for Year 9 Students

RESEARCH AND DEVELOPMENT DEPARTMENT
www.research.gov.mt
2014
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• In which liquid would object float

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• Volcanic eruption effects
• Major causes of tides
• Difference between planets and moons
• Soil change due to natural causes
• Material that breaks down quickly
• Changes at high elevations – DERIVED
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• Where active volcanoes are found
• Evaporated water ending up as rain
• Evidence continents were joined
• Advantage of terracing method
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About TIMSS

The Trends in International Mathematics and Science Study (TIMSS) is an international assessment of the mathematics and science knowledge of 4th and 8th grade students around the world. TIMSS was developed by the International Association for the Evaluation of Educational Achievement (IEA) to allow participating nations to compare students' educational achievement across borders. TIMSS was first administered in 1995, and every 4 years thereafter. Malta participated in 2007 with Form 3 students and in 2011 with Year 5 students. In April 2014, 22 Maltese schools participated in the TIMSS 2015 Field Trial and in April 2015 all state, church and independent school Year 9 students will sit for TIMSS 2015.

SOURCE: TIMSS 2011 Assessment. Copyright © 2013 International Association for the Evaluation of Educational Achievement (IEA). Publisher: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College, Chestnut Hill, MA and International Association for the Evaluation of Educational Achievement (IEA), IEA Secretariat, Amsterdam, the Netherlands
Introduction

This resource pack contains the released TIMSS 2011 grade 8 (Year 9) science assessment items. This is not a complete set of all TIMSS 2011 assessment items because some items are kept confidential so that they may be used in subsequent cycles of TIMSS to measure trends.

In order to familiarise students with such assessment, the Research and Development Department is disseminating this teacher resource pack which incorporates samples of released questions. The purpose of this pack is to be used as a teaching resource for students in secondary schooling.

The items in this resource pack present different ways of measuring students’ understanding in various content and cognitive domains. Across the top, in the teacher’s section, are three boxes which identify the item’s subject, topic and cognitive domain, as shown in the table below.

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Content Domain</th>
<th>Main Topic</th>
<th>Cognitive Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>Subject Matter in Science that the item assesses</td>
<td>Specific Topic assessed within the subject matter</td>
<td>The cognitive or thinking process assess</td>
</tr>
<tr>
<td>Biology</td>
<td>Ecosystems</td>
<td>Knowing</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>Chemical Change</td>
<td>Applying</td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td>Electricity and Magnetism</td>
<td>Reasoning</td>
<td></td>
</tr>
<tr>
<td>Earth Science</td>
<td>Earth’s Structure and Physical Features</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Student responses can be scored according to the scoring information provided in the pack. Items that coincide with concepts taught in class allow the teacher to gain feedback on the students’ understanding of assessed concepts. The teacher might use the items to identify particular difficulties or misconceptions experienced by individual students, which can serve as the basis for some remedial teaching or focused practice. Teachers are also encouraged to model other questions according to their students’ needs and levels of ability. However, this pack is not intended to coach the students for the test but to familiarise themselves with the types and styles of the items.

This resource pack follows other information sources published by IEA and the Research and Development Department. Data and information has also been disseminated particularly through the TIMSS Malta Report 2013, dissemination workshops (May – July 2013), as well as through meetings and training seminars for School Coordinators and Test Administrators. Further information regarding TIMSS may be accessed on: [http://www.iea.nl/timss_2015.html](http://www.iea.nl/timss_2015.html) and [www.research.gov.mt](http://www.research.gov.mt)
Guidelines for Question Format

Questions follow the indicated format:

**Question 8: Conditions for germination - DERIVED**

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

1. 

2. 

**Teacher’s Notes**

<table>
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<tbody>
<tr>
<td>BIOLOGY</td>
<td>Life Cycles, Reproduction and Heredity</td>
<td>Knowing</td>
</tr>
</tbody>
</table>

**Scoring**

Note: Each of the two responses are scored separately. However, if the two responses are essentially the same, the second response should be scored as ‘Incorrect Response’

**Correct Response**
- Water (moisture, rain) or similar
  - Example: Humid conditions
- Suitable temperature (heat, warmth) or similar
  - Example: Heat about 27°C
- Oxygen (air)
- Other correct

**Incorrect Response**
- Soil or similar
- Sun, sunlight or light (no explicit mention of heat, warmth or similar)
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Content Domain:

BIOLOGY
**Question 1: One function of the uterus**

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

**Teacher’s Notes**

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**Scoring**

**Correct Response**

- States that the embryo (fetus, fertilized egg, etc.) develops in the uterus (or similar)
  - Examples:
    - The uterus protects the baby while it grows.
    - The baby develops from the egg inside the uterus.

- Other Correct
  - Example: The muscles in the uterus contract and push the baby out.

**Incorrect Response**

- States a reproductive organ or function but with an incorrect/inadequate connection to the function of the uterus.
- Confuses the reproductive and urinary systems.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 2: Long-term immunity against disease

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

A. antibiotics
B. vitamins
C. vaccines
D. red blood cells

Teacher’s Notes

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</table>

Correct Response | C
Question 3: Eyes react to change

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

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

Teacher’s Notes

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Scoring

Correct Response
• Indicates LIGHT and identifies which diagram corresponds to the low/high light level.
  Diagram 1 = dim light, low light level, or similar
  Diagram 2 = bright light, high light level, or similar
  Example: There is less light in Diagram 1. The pupil has gotten larger to let in more light.
• Other fully correct.

Partially Correct Response
• Indicates LIGHT but does not identify which diagram corresponds to low/high light level.
  Example: It is the light level. In Diagram 1, the pupils are bigger. In diagram 2 they are smaller.
• Other partially correct.

Incorrect Response
• Indicates LIGHT but reverses the conditions in Diagrams 1 and 2.
• Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 4: Antelope population graph

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

A. global warming
B. absence of predators
C. depletion of the ozone layer
D. brush fires that destroyed the food supply

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Correct Response | D
**Question 5: Difference in snail shell colors**

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

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<td>Diversity, Adaptations and Natural Selection</td>
<td>Applying</td>
</tr>
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**Scoring**

**Correct Response**

- Explanation refers explicitly to BOTH camouflage (blending in with surroundings, or similar) AND protection from birds, predators, enemies, etc
  Example: The snails that live in the forest have dark shells so the birds cannot see them to eat them.

- Explanation refers only to camouflage, blending in with surroundings, or similar. [Protection from predators NOT explicitly mentioned.]
  Example: It helps the snail to camouflage with their surroundings.

- Other fully correct

**Partially Correct Response**

- Explanation refers only to not being eaten or seen by predators [Camouflage NOT references]
  Example: So the birds will not eat them,

- Other partially correct

**Incorrect Response**

- Mentions only that it is dark in the forest and light in the field [Does not explicitly refer to camouflage, protection from predators or similar]
**Question 6: Cells that destroy bacteria**

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

A. White blood cells  
B. Red blood cells  
C. Kidney cells  
D. Lung cells

**Teacher’s Notes**

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</table>

**Correct Response** | A
Question 7: Growth of algae in a lake

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

A. A decrease in air temperature  
B. A decrease in water level  
C. Fertilizer runoff from the farm  
D. Exhaust gases from farm equipment

Teacher’s Notes

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Correct Response: C
Question 8: Conditions for germination- DERIVED

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

1. 

2. 

Teacher’s Notes

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Scoring

Note: Each of the two responses are scored separately. However, if the two responses are essentially the same, the second response should be scored as ‘Incorrect Response’

Correct Response
• Water (moisture, rain) or similar
  Example: Humid conditions
• Suitable temperature (heat, warmth) or similar
  Example: Heat about 27°C
• Oxygen (air)
• Other correct

Incorrect Response
• Soil or similar
• Sun, sunlight or light (no explicit mention of heat, warmth or similar)
• Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 9: Classification of Animals

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

<table>
<thead>
<tr>
<th>Category 1</th>
<th>Category 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbit</td>
<td>Frog</td>
</tr>
<tr>
<td>Giraffe</td>
<td>Spider</td>
</tr>
<tr>
<td>Elephant</td>
<td>Lion</td>
</tr>
</tbody>
</table>

Which of the following was used to classify these animals?

A. Organs used in breathing  
B. Food source  
C. Method of reproduction  
D. Pattern of movement

Teacher’s Notes

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</table>

Correct Response  B
Question 10: Purpose of cellular respiration

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

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

Teacher’s Notes

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<tbody>
<tr>
<td>BIOLOGY</td>
<td>Cells and Their Functions</td>
<td>Knowing</td>
</tr>
</tbody>
</table>

Correct Response | A
Question 11: Number of kidneys son has at birth

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

A. How many kidneys did his son have at birth?

B. Explain your answer

Teacher’s Notes

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<td>Applying</td>
</tr>
</tbody>
</table>

Scoring

Correct Response
- TWO with an explanation based on the removal of a kidney not being a hereditary trait (or similar)
  Examples:
  Removal of his kidney is not in his genes, so it will not be passed on. It’s not hereditary
- TWO with an explanation based on all humans (normally) having two kidneys at birth (or similar). [No explicit mention of heredity].
  Examples:
  Everybody is born with two kidneys unless they have a disease.
  His child would still have the normal number, which is 2.
- Other correct

Incorrect Response
- ONE with or without explanation
- TWO with no explanation or an incorrect explanation
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 12: Exercise is important for health

State one reason why exercise is important for good health.

Teacher’s Notes

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<tbody>
<tr>
<td>BIOLOGY</td>
<td>Human Health</td>
<td>Knowing</td>
</tr>
</tbody>
</table>

**Scoring**

**Correct Response**
- States weight loss, preventing fat storage, lowering cholesterol, or similar. Example: It burns fat.
- States that exercise is beneficial for the heart, circulation, oxygen levels, or similar. Example: It keeps your heart in good condition so you don’t have heart attacks.
- States building muscle strength/tone or similar. Example: It helps build muscle.
- Other correct

**Incorrect Response**
- Gives only a general response related to staying healthy, fit, being strong, or similar.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
**Question 13: True statement about producers**

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

A. They use energy from the sun to make food

B. They absorb energy from a host animals

C. They get energy from eating living plants

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

**Teacher’s Notes**

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</table>

**Correct Response**

A
Question 14: Population in countries: predict

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

<table>
<thead>
<tr>
<th></th>
<th>Country 1</th>
<th>Country 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (millions)</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Annual birth rate</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>(births per 1000 people)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual death rate</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>(deaths per 1000 people)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in square kilometers</td>
<td>2,000,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Grain production</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>(percentage of world total)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil consumption</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td>(percentage of world total)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Population will Increase</th>
<th>Population will Decrease</th>
<th>Population will Stay the Same</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country 2</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Scoring

Correct Response
• Country 1: Population will stay the same
• Country 2: Population will increase

Incorrect Response
• Country 1: correct, Country 2 incorrect
• Country 2: correct, Country 1 incorrect
• Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 15: Population in countries: landuse

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

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

Landuse

Teacher’s Notes

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Scoring

Correct Response
• Predicts that land use in Country 2 is likely to increase (due to the increased population).
• Predicts that land use will increase with population.[Does not explicitly refer to Country 1 or Country 2]
• Makes a prediction about land use based on the current population that is supported by data in the table.
• Other correct

Incorrect Response
• Makes a statement about land use that is NOT explicitly connected to either population prediction or data in the table.
• Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 16: Population in countries: landuse

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

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

Pollution

Teacher's Notes

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<tr>
<td>BIOLOGY</td>
<td>Ecosystems</td>
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</tr>
</tbody>
</table>

Scoring

Correct Response

- Predicts that pollution in Country 2 may increase (due to factors related to the growing population). Example: There will be more pollution in Country 2 as the population increases
- Predicts that pollution will increase with population. [Does not explicitly refer to Country 1 or Country 2.] Example: Many more people means more pollution.
- Makes a prediction about pollution based on the current population that is supported by data in the table. Example: Country 1 will pollute more because it consumes more oil than Country 2.
- Other correct

Incorrect Response

- Makes a statement about pollution that is NOT explicitly connected to either population prediction or data in the table.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 17: Lungs in bird/which organ in frog

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

A. Kidney
B. Skin
C. Liver
D. Heart

Teacher’s Notes

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<td></td>
<td>Processes of Organisms</td>
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</table>

Correct Response: B
The diagram shows a plant cell. What is the function of the part of the cell labeled X?

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

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</table>

**Correct Response**  
D
Question 19: CO2 concentration & photosynthesis

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

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

She plotted her results as shown below.

Look at the graph

A. Does an increase in carbon dioxide concentration affect the rate of photosynthesis? (Check one box)
   - [ ] Yes
   - [ ] No

B. Explain your answer
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**Scoring**

**Correct Response**

- Yes with an explanation that refers to carbon dioxide being required for (needed for, used during) photosynthesis. The explanation may or may not include a specific reference to the graph.
  
  Examples:
  
  Carbon dioxide is required for photosynthesis. The higher the concentration of carbon dioxide the faster the rate of photosynthesis.
  
  For photosynthesis to take place it needs carbon dioxide.

- Yes with an explanation that refers only to the graph (either explicitly or implicitly).
  
  Examples:
  
  One with 0.03 carbon dioxide is lower than the one with 0.4 carbon dioxide.
  
  Yes, at light intensity 3, the rate of photosynthesis is 1.2 at 0.40 and 0.3 at 0.03.

**Incorrect Response**

- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 20: Process of respiration

Which equation summarizes the process of respiration?

A. water + carbon dioxide + energy → sugar + oxygen
B. oxygen + sugar → carbon dioxide + water + energy
C. carbon dioxide + oxygen + water → sugar + energy
D. sugar + carbon dioxide + energy → oxygen + water

Teacher’s Notes

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</table>

Correct Response: B
Question 21: Where organisms appeared on Earth?

Where did organisms live when they first appeared on Earth?

A. In the water
B. In the air
C. On the land
D. Under the ground

Teacher’s Notes

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<tr>
<td>BIOLOGY</td>
<td>Diversity, Adaptation and Natural Selection</td>
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</table>

Correct Response: A
Question 22: Year of highest rabbit population

A population of rabbits and foxes live in a remote area. The foxes do not have any predators.

Scientist counted the number of rabbits and foxes over a long time period and plotted their results, as shown below.

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

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</tbody>
</table>

Scoring

Correct Response
- 1983 – 1985

Incorrect Response
- States the year for foxes: 1988 – 1990
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 23: Relation of rabbit-fox populations

A population of rabbits and foxes live in a remote area. The foxes do not have any predators.

Scientist counted the number of rabbits and foxes over a long time period and plotted their results, as shown below.

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

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Scoring

Correct Response
- Describes how the changes in population are related by referring to the foxes (predators) eating the rabbits (prey). Example: As the population of rabbits increased, the foxes also increased as they have more rabbits to eat.
- Relates the graph of the fox population to that of the rabbit population without reference to predator/prey. Example: When the rabbit population increases, the fox population increases and when the rabbit population decreases, the fox population decreases.

Incorrect Response
- States that foxes eat rabbits without describing how the changes in population size are related.
- Gives a general description that relates to both going up and down without mentioning how the changes in population size are related.
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 24: Life Function of a Paramecium

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

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

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

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Scoring

Correct Response
- States one life function as noted below.
  - Getting rid of waste (wastes would poison the cell)
  - Reproduction (the species would die out otherwise)
  - Taking in oxygen/respire (needed to produce energy)
  - Responding to stimuli (moving towards food)
  - Digestion (breaking down food substances)

Incorrect Response
- Refers to taking in water.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
**Question 25: Investigation of green/red peppers**

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

They are looking at some green and red peppers.

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

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

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

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**Scoring**

**Correct Response**
- Refers to either
  1) planting (seeds from) green and red peppers AND observing the color of the fruit OR
  2) planting (seeds from) green peppers AND observing if the fruit turns red.
- Other fully correct

**Partially Correct Response**
- Refers to ONLY planting (seeds from) green/red peppers. Example: You could grow seeds from each pepper.
- Other correct

**Incorrect Response**
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 26: Importance of removing weeds

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

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Scoring

Correct Response
• Mentions competition for resources (nutrients, water, sunlight).
  Examples:
  They compete with other plants for space, water and sunlight. The weeds will compete with the seedlings for food and water.

Incorrect Response
• Mentions competition for space and/or weeds reproducing (growing) rapidly.
  Examples:
  They would grow very quickly and take over the field.
  They reproduce too rapidly.

• Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
**Question 27: Conclusion from pulse rate-T graph**

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

![Pulse rate graph](image)

What can be concluded from his results?

A. His pulse rate increased by 50 beats per minute
B. His pulse rate took less time to slow down than to increase
C. His pulse rate after 4 minutes was 80 beats per minute
D. His pulse rate returned to normal in less than 6 minutes.

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</table>

**Correct Response** D
Question 28: Water travels through a plant

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

Which experiment would show this?

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

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

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

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

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</table>

Correct Response: B
Question 29: Foods diabetics should avoid

John has diabetes.
Which of the following should he be careful about eating or drinking?

A. Beef
B. Eggs
C. Milk
D. Fruit Juice

Teacher’s Notes

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Correct Response: D
Question 30: Mayor wants to plant trees

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

A. Do you agree with the mayor’s suggestion?
   (Check one box.)

   [ ] Yes
   [ ] No

B. Explain your answer.

Teacher’s Notes

Content Domain | Main Topic | Cognitive Domain
--- | --- | ---
BIOLOGY | Ecosystems | Reasoning

Scoring

Correct Response
- Yes with an explanation that trees absorb carbon dioxide (during photosynthesis).
  Examples:
  Yes – When trees photosynthesize they take in carbon dioxide and give out oxygen.
  Yes – Trees take in carbon dioxide.
- No with a valid explanation related to reducing carbon dioxide emission.
  Examples:
  No – The mayor should suggest ways to cut the amount of carbon dioxide by getting people to walk or cycle.
  No – I disagree with the mayor, as planting more trees won’t solve the problem the same way as lessening the amount of cars on the road.

Incorrect Response
- Incorrect (including crossed out, erased, stray marks, illegible, or off task), including the following response: Explanation relates to oxygen only.
Question 31: Genetic makeup of twins

Twins are born. One is a boy and one is a girl.
Which statement is correct about their genetic makeup?

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

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

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

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

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Correct Response: C
Content Domain:

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

What causes this to happen?

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Scoring

Correct Response
- States that carbon dioxide is given off (as a result of chemical reaction). Example: Chemical reaction expels carbon dioxide which blows the balloon up.
- States that a gas is given off (as a result of chemical reaction). [Does NOT explicitly mention carbon dioxide] Example: When they mix the two chemicals, a gas is produced and it goes up into the balloon.
- States that a chemical reaction occurs. [Does NOT explicitly mention gas production] Example: Vinegar has a reaction when it is mixed with sodium bicarbonate.
- Other correct

Incorrect Response
- Refers only to gas (air) rising into the balloon, or similar. [No mention of chemical reaction or gas production]
- Refers to production of air, helium or some other incorrect gas.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Bob did an experiment to investigate the effect of temperature on the solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 litre of water at different temperatures. He then plotted his results.

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

A.  

B.  

C.  

D.  

**Teacher’s Notes**

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</table>

**Correct Response** C
**Question 34: Diagram of water molecules**

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

Which of the diagrams best represents water?

![Diagrams A, B, C, D](image)

**Teacher’s Notes**

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</table>

**Correct Response** C
Question 35: Identify if substance is metal

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

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Scoring

Correct Response

- Response based on a characteristic property of common metals that can be measured (e.g., conductor of heat, conductor of electricity, thermal expansion, density, magnetic properties, melting point).
- Response based on physical appearance or form (e.g., shiny appearance, hardness, malleability/ductility).
- Response based on chemical reactivity of metals (e.g., tendency to undergo oxidation, reaction with acid).
- Other correct

Incorrect Response

- Refers to a magnetic test that is incorrect; no procedure given or indicates that all metals are attracted to magnets or that NON-attraction indicates a non-metal.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 36: Diagram for structure of matter

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

![Diagram A](#)

![Diagram B](#)

![Diagram C](#)

![Diagram D](#)

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</table>

Correct Response: B
Question 37: Energy released during a reaction

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

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</table>

Scoring

Correct Response

• Refers to heat or temperature increase (or similar)
• Refers to explosion or hearing sound (or similar)
• Refers to light production or seeing flames (or similar)
• Other correct. Example: If the chemical reaction causes something to move, like with a rocket blast.

Incorrect Response

• Refers only to steam, smoke, bubbling, gas production (or similar). (No explicit reference to heat)
• Refers only to other evidence or change in materials that does not necessarily indicate that energy has been released (e.g., smell, color change).
• Other incorrect (including crossed out, erased, stray marks, illegible or off task)
Question 38: Which rod causes the bulb to light?

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

Which rod would cause the bulb to light?

A. Copper rod  
B. Wood rod  
C. Glass rod  
D. Plastic rod

Teacher’s Notes

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</table>

Correct Response | A
Question 39: Formula for carbon dioxide

What is the chemical formula for carbon dioxide?

A. CO
B. CO₂
C. C
D. O₂

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</table>

Correct Response B
Question 40: Number of atoms in H2SO4 molecule

Complete the table below to show the number of atoms of each element in a molecule of sulfuric acid (H₂SO₄)

<table>
<thead>
<tr>
<th>Element</th>
<th>Number of Atoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td></td>
</tr>
<tr>
<td>Sulfur</td>
<td></td>
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<tr>
<td>Oxygen</td>
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<td>CHEMISTRY</td>
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</table>

Scoring

Correct Response
- Completes the table as shown below:

<table>
<thead>
<tr>
<th>Element</th>
<th>Number of Atoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>2</td>
</tr>
<tr>
<td>Sulfur</td>
<td>1</td>
</tr>
<tr>
<td>Oxygen</td>
<td>4</td>
</tr>
</tbody>
</table>

Incorrect Response
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 41: Ammonia solution mixed in vinegar

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

What process occurred?

A. Rusting
B. Melting
C. Evaporation
D. Neutralization

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<td>Knowing</td>
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</table>

Correct Response: D
**Question 42: Observations for reaction**

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

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

1. 
2. 

**Teacher's Notes**

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**Scoring**

**Correct Response**
- Describes two different observations as listed below:
  - Appearance of a new color (color change)
  - Seeing gas production (bubbling, foaming)
  - Hearing a noise (fizzing)
  - Smelling a gas
  - Changing temperature (increase or decrease)
  - A precipitate forming
  - Light being emitted
  - An explosion taking place

**Partially Correct Response**
- Describes one observation as listed above.

**Incorrect Response**
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 43: Process in which energy absorbed

During which chemical process is energy absorbed?

A. Iron nails rusting
B. Candles burning
C. Vegetables rotting
D. Plants photosynthesizing

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</table>

Correct Response: D
Question 44: Classify element/compound/mixture

The table below shows some elements, compounds and mixtures.
Classify them by putting an X in the appropriate column beside each one.

<table>
<thead>
<tr>
<th></th>
<th>Element</th>
<th>Compound</th>
<th>Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Gold</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sea water</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Helium</td>
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<td>Classification and Composition of Matter</td>
<td>Applying</td>
</tr>
</tbody>
</table>

Scoring

Correct Response
- Classifies all 6 correctly.

Partially Correct Response
- Classifies 4 or 5 correctly

Incorrect Response
- Classifies 2 or 3 correctly
- Classifies 1 correctly
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 45: Definition of a compound

Which of the following defines a compound?

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

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Correct Response: C
Question 46: Fire put out by blanket

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

A. This lowers the temperature
B. This makes the flames smaller.
C. This absorbs the burning substance.
D. This keeps oxygen from reaching the fire.

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Correct Response D
Question 47: List two substances that are metal

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

<table>
<thead>
<tr>
<th>Physical state at room temperature (20°C)</th>
<th>Substance A</th>
<th>Substance B</th>
<th>Substance C</th>
<th>Substance D</th>
<th>Substance E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shiny grey</td>
<td>solid</td>
<td>solid</td>
<td>liquid</td>
<td>liquid</td>
<td>Gas</td>
</tr>
<tr>
<td>Appearance/color</td>
<td>white</td>
<td>silver</td>
<td>colorless</td>
<td>Colorless</td>
<td>Colorless</td>
</tr>
<tr>
<td>Conducts electricity</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

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

1. 
2. 

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Scoring

Correct Response
- Lists substances A and C

Incorrect Response
- Lists substance A with an incorrect or no other substance listed.
- Lists substance C with an incorrect or no other substance listed.
- Other incorrect (including crossed out, erased, stray marks, illegible or off task) including the following response:
  1. Shiny grey
  2. Silver
**Question 48: Atoms in a crushed can**

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

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

A. The atoms are broken
B. The atoms are flattened
C. The atoms remain the same
D. The atoms are changed into different atoms.

**Teacher’s Notes**

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</table>

**Correct Response** C
Question 49: Water splitting rock

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

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

Teacher’s Notes

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</table>

Correct Response: A
Content Domain:

PHYSICS
Question 51: Energy conversion in a flashlight

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

A. Electrical → mechanical → light
B. Chemical → mechanical → light
C. Chemical → electrical → light
D. Nuclear → electrical → light

Teacher’s Notes

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Correct Response: C
Question 52: Gravity acting on parachute jumper

The figure shows a parachute jumper in four positions:

1. In the aircraft before the jump
2. In freefall immediately after jumping before parachute opens
3. Falling to the ground after the parachute opens
4. On the ground just after landing

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

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

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</table>

Correct Response: D
Question 53: Molecules of gas when heated

A gas is heated and its temperature increases.

What happens to the gas molecules?

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

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</table>

Correct Response: B
Question 54: Bulbs in series/parallel circuit

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

Which statement is true?

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

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</table>

Correct Response: D
Question 55: Gaps between metal rail spans

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

A. To allow for the metal tracks to expand on hot days
B. To allow for the metal to expand on cold days
C. To allow for cooling of the tracks by air in the gaps
D. To allow for vibration of the tracks due to the train

Teacher’s Notes

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<tbody>
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</table>

Correct Response: A
Question 56: Water level in heated container

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

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

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

B. Explain your answer

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Scoring

Correct Response
- HIGHER (1) with a correct explanation that refers to air expanding when heated or an increase in volume or pressure (or similar)
  Examples:
  When the sphere is heated, the air expands and pushes the water up the tube.
  The pressure will make the water rise.
- Other correct

Incorrect Response
- HIGHER (1) with no explanation or an incorrect explanation
- LOWER (2) with no explanation or an incorrect explanation
- SAME (3) with no explanation or an incorrect explanation
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 57: Why bottle collapses in the valley

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

Which of the following best explains why this happened?

A. The temperature is lower in the valley than on the mountain top
B. The temperature is higher in the valley than on the mountain top
C. Air pressure in the valley is lower than on the mountain top
D. Air pressure in the valley is higher than on the mountain top

Teacher’s Notes

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</table>

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

What will happen to the sound of the bell when the air is pumped out of the jar?

Explain your answer.

**Teacher's Notes**

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</table>

**Scoring**

**Correct Response**
- Refers to sound fading AND explains that sound needs a medium to travel through (or similar)
  - Example: The sound will die out because if there is no air, then it cannot transfer the sound.
- Other fully correct

**Partially Correct Response**
- Refers to sound fading (or similar) with NO further explanation.
- Refers to sound fading with a minimal explanation that refers only to the vacuum or lack of air. (Does not explicitly refer to sound needing a medium to travel through).
- Other partially correct

**Incorrect Response**
- Refers to sound disappearing (or similar) with an incorrect explanation that reflects a misconception about the production/transmission of sound.
- Refers to sound being louder, clearer (or similar) with or without further explanation
- Other incorrect (including crossed out, erased, stray marks, illegible or off task)
A student attaches four drawing pins to a copper rod using candle wax as shown in the diagram. The rod is then heated continuously at one end and the pins fall off in the order 4,3,2,1.

By which process does the heat reach the pins?

A. expansion
B. radiation
C. conduction
D. convection

Teacher’s Notes

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</table>

Correct Response: C
Question 60: Change-stay the same-DERIVED

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

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

<table>
<thead>
<tr>
<th></th>
<th>Changes</th>
<th>Stays the Same</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size of molecules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed of molecules</td>
<td></td>
<td></td>
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</table>

Teacher’s Notes

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</tbody>
</table>

Scoring

Correct Response

- Places the X’s correctly as shown below:

<table>
<thead>
<tr>
<th></th>
<th>Changes</th>
<th>Stays the Same</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Volume</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Size of molecules</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Speed of molecules</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Incorrect Response

- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 61: Strength of a magnet

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

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

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

Teacher’s Notes

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Correct Response  C
Question 62: Position of thermometer

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

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

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

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Correct Response: C
Question 63: One variable kept constant

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

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

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

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</table>

Scoring

Correct Response
- Lists one variable as shown below
  - The beakers (same, same shape, same size, same materials)
  - The water (same volume, from the same place)
  - The thermometer (same type, same position for taking readings)
  - Location of the experiment (same place, same room)

Incorrect Response
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
  - Example:
    - The initial temperature.
    - Checking the temperature.
    - Timing.
Question 64: Conclusion from the graph

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

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

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Scoring

Correct Response
• States that the Bunsen Burner heated the water faster than the hot plate
  Examples:
  The Bunsen burner heated faster because the temperature of the water after 10 minutes was higher than the temperature of the water being heated by the hot plate.
  The Bunsen burner heats up water at a faster rate than the hot plate

Incorrect Response
• Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 65: Molecules of liquid when it cools

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

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

Teacher’s Notes

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Correct Response: A
Question 66: Speed of light through substances

Light travels fastest through which of the following?

A. Air
B. Glass
C. Water
D. A vacuum

Teacher's Notes

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</table>

Correct Response: D
**Question 67: Path of light through periscope**

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

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

![Diagram of a periscope with light rays]

**Teacher's Notes**

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**Scoring**

**Correct Response**
- Draws a correct path of the light ray with arrows showing the direction as shown below.

![Correct Path Diagram]

**Incorrect Response**
- Draws a correct path of the light ray, but arrows are missing.
- Draws a correct path of the light ray, but the direction is reversed.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
**Question 68: Find out if metal 2 is a magnet**

Ray has two metal bars. He knows Metal bar 1 is a magnet.

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

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

**Teacher’s Notes**

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**Scoring**

**Correct Response**

- Refers to metals repelling each other. May or may not include attraction
  
  Examples:
  
  Put one end of Metal 1 to both ends of Metal2; If the metals repel, then Metal 2 is a magnet. When either one of the ends goes near metal 2 it repels.

**Incorrect Response**

- Refers to attraction only
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 69: Liquid on outside of pitcher

Ice-cold water was placed in a glass pitcher on a hot day (Diagram 1).

Soon afterwards, liquid appeared on the outside of the pitcher (Diagram 2).

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

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Scoring

Correct Response
- Describes the process of condensation by referring to water vapor (in the air) condensing on the cool outside surface of the pitcher.
  Examples: It came from the water vapor condensing on the cool surface of a glass pitcher.

Partially Correct Response
- Describes the process of condensation by referring to water vapor (in the air) condensing without mentioning the coolness of the pitcher
  Examples: The liquid came from the water vapor condensing.
- States condensation without referring to water vapor.

Incorrect Response
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 70: Which ice block will melt first

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

A. Which ice block will melt first?
(Check one box.)

☐ Block 1
☐ Block 2

B. Explain your answer

Teacher’s Notes

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Scoring

Correct Response
• Block 1 with an explanation referring to heat OR surrounding air (hot air, sun) reaching ice block 1 more easily than ice block 2.

Examples:
Block 1 gains heat from the surrounding air. Block 2 does not gain much heat as it is wrapped in newspaper.
The newspaper helps to block some of the heat.

Incorrect Response
• Block 2 with an explanation referring explicitly or implicitly to the newspaper making the ice block warmer.
• Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 71: Water wheel: Energy of tank water

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

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

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Scoring

Correct Response
• (Gravitational) potential energy or gravitational energy or stored energy

Incorrect Response
• Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 72: Water wheel: Energy before wheel

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

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

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Scoring

Correct Response
- Kinetic energy (with or without (gravitational) potential energy or gravitational energy, or stored energy)

Incorrect Response
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 73: Water wheel: Faster rotation

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

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

Teacher’s Notes

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Scoring

Correct Response
- Gives a reason related to increasing the flow of water from the list of acceptable responses below.
  - Put more water in the tank
  - Use a tailer water tank
  - Make the outlet wider/bigger
  - Make another outlet
  - Increase the distance between the wheel and the tank
  - Make the wheel smaller
  - Make the baldes wider/bigger/longer
  - Increase the number of blades

Incorrect Response
- Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 74: In which liquid would object float

An object has a density of 1.1g/cm³

A. In which liquid would this object float?
   (Check one box)
   - Liquid X: 1.31g/cm³
   - Liquid Y: 0.91g/cm³

B. Explain your answer

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Scoring

Correct Response

- Liquid X with an explanation that refers to the object being less dense.  
  Examples:
  Liquid X – The density of the object is lower than the density of liquid X, so it can float in liquid X.
  Liquid X – In order for the object to float, it must have a lower density than the liquid.

Incorrect Response

- Liquid X with an explanation that refers to the object/liquid being heavier or lighter.
- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Content Domain:

Earth Science
Question 75: Order of steps in the water cycle

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

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

______ Water vapor rises in warm air
______ Water travels along a river to the sea
______ Water evaporates from the sea
______ Water vapor is cooled and forms clouds
______ Clouds move and water falls on land as rain.

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Scoring

Correct Response
• 2, 5, 1, 3, 4

Incorrect Response
• Incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 76: Volcanic eruption effects

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

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**Scoring**

**Correct Response**
- States a negative environmental effect due to volcanic eruptions such as pollution (due to release of gases, smoke, ash, etc) or destruction of habitats or plant/animal life (due to lava flow, burning or similar).
  Example: Burns away essential plant life.

- States a positive environmental effect such as making land fertile, creating new habitats and allowing for different life forms.
  Example: It can make the land surrounding the volcano more fertile

- Other correct

**Incorrect Response**
- Gives only a general statement of destruction or the nature of volcanic eruptions with inadequate description of how the environment is affected.
  Example: It can destroy everything.

- Other incorrect (including crossed out, erased, stray marks, illegible, or off task)
Question 77: Major cause of tides

Which of the following is the major cause of tides?

A. Heating of the oceans by the Sun

B. Gravitational pull of the Moon

C. Earthquakes on the ocean floor

D. Changes in wind direction.

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Correct Response: B
Question 78: Difference between planets and moons

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

A. All planets can support life; moons cannot.

B. All planets have atmospheres; moons do not.

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

D. All planets are larger than all moons.

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Correct Response: C
Question 79: Soil changes due to natural causes

Soils change both through natural processes and as a result of human activity.

Which of the following soil changes is due only to natural causes?

A. Degradation of nutrients due to pesticides
B. Formation of deserts due to tree falling
C. Flooding due to dam construction
D. Removal of nutrients due to heavy rains

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Correct Response | D
**Question 80: Material that breaks down quickly**

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

- A. steel
- B. plastic
- C. glass
- D. paper

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**Correct Response**

D
**Question 81: Changes at high elevations - DERIVED**

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

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

<table>
<thead>
<tr>
<th>Change in Atmospheric Condition</th>
<th>What Tamora Needs to Bring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
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**Scoring**

Note: Each of the two responses are scored separately. However, if the two responses are essentially the same, the second response should be scored as ‘Incorrect Response’.

**Correct Response**
- Indicates that the temperature will decrease (or similar). Example: The temperature will be colder (more clothes)
- Indicates that there will be less oxygen (air) or lower atmospheric pressure (or similar) Example: Air will get thinner (oxygen mask)
- Indicates increased precipitation (snow, rain) or clouds (or similar). Example: It will get icy (bring ice shoes)
- Other correct

**Incorrect Response**
- Mentions a type of equipment but does not clearly indicate how the atmospheric condition changes.
- Mentions that the atmospheric pressure increases with or without listing oxygen equipment.
- Other incorrect (including crossed out, erased, stray marks, illegible or off task)
Question 82: Topographic map: identify X

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

E. What geographical feature is found at point X?

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Scoring

Correct Response
- Identifies X as a mountain, hill, peak, or similar highest point, volcano or similar

Incorrect Response
- Identifies X as a crater, valley, hole or similar (misinterpretation that contour lines indicate decreasing elevation)
- Identifies X as a water feature
- Other incorrect (including crossed out, erased, stray marks, illegible or off task)
The diagram above shows a topographic map of Tiger Island. The lines on the map are contour lines that connect points at the same elevation. The elevations shown are in meters.

B. Think about the source of rivers and how they flow. Now draw the path of a river between point X and Cub Bay. Set an arrow to indicate on the map which direction the river will flow.
Question 84: Location of Jungle

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

A. Location 1
B. Location 2
C. Location 3
D. Location 4

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Correct Response A
Question 85: Where active volcanoes are found

Where are active volcanoes most likely to be found?

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

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Correct Response | B
Question 86: Evaporated water ending up as rain

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

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**Scoring**

**Correct Response**
- Mentions two OR three of the factors indicated below.
  a. Clouds form (condensation)
  b. The clouds move to land (blown by the wind)
  c. Rain falls from clouds (because drops become too heavy/temperature drops)
  Example: That’s because there will be condensation and the clouds form. The clouds move to land and when temperatures drop the water in the clouds condenses and falls as rain.

**Partially Correct Response**
- Mentions only one factor indicated above
  Example: Water vapour condenses into clouds.

**Incorrect Response**
- Incorrect (including crossed out, erased, stray marks, illegible or off task)
**Question 87: Evidence continents were joined**

Two continents are separated by water.

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

What fossil evidence would support this idea?

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**Scoring**

**Correct Response**

- Explains that fossils from identical (land) organisms (that cannot fly or swim) can be found on both continents.

  Examples:
  The same species of extinct animals are found on the two continents.
  If the same fossilized animals are found on both continents.

**Incorrect Response**

- Incorrect (including crossed out, erased, stray marks, illegible or off task)
Question 87: Advantage of terracing method

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

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

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Scoring

Correct Response
• Writes one advantage of using the terracing method from the list of acceptable responses below:

  Allow farming to be done on a slope (utilize more land)
  Run-off slowed down (prevents crops from washing away)
  Prevents soil erosion (landslides, rock slides)
  Able to grow different crops
  Retains water so crops are healthier/need less watering

Examples:
  You can farm in steep places.
  Helps to avoid the washing away of crops on hills.

Incorrect Response
• Incorrect (including crossed out, erased, stray marks, illegible or off task)
Question 88: Holes in volcanic rocks

Some volcanic rocks have many holes in them.

How were the holes made?

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

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Correct Response: B
For further information about TIMSS in Malta please contact

**TIMSS National Centre**

Research and Development Department
Ministry for Education and Employment


email: timss.medec@gov.mt

Tel: 25982722, 25982737, 25982257