Grade 8 Science Practice Test Answer Key
Item 1

**Alignment:** MS-ESS2-4: Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity.
- **SEP:** Developing and Using Models
- **DCI:** ESS2.C: The Roles of Water in Earth’s Surface Processes
- **CCC:** Energy and Matter

In the graphs below, illustrate three factors that change over the course of the day causing the fog to appear and disappear. The horizontal axis on each graph represents the 24-hour day shown in the animation.

For each graph’s vertical axis, select the factor that you would like to graph. Then, use the Connect Line button to draw a graph that shows the pattern of change over time. To receive credit, your line segments must be connected and form a continuous graph.

**Part A**

Variable for vertical axis of Graph A: [Dropdown]

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**Options:**
- Air temperature
- Amount of cloud cover
- Proportion of carbon dioxide in air in liquid form
- Proportion of oxygen in air
- Proportion of water in air in gas form
- Sunlight intensity
The student earns a point for drawing a line indicating that the intensity of sunlight increases as the fog disappears.
Part B

Variable for vertical axis of Graph B: 

Options:
- Air temperature
- Amount of cloud cover
- Proportion of carbon dioxide in air in liquid form
- Proportion of oxygen in air
- Proportion of water in air in gas form
- Sunlight intensity

Answer:
Part B

Variable for vertical axis of Graph B: air temperature

The student earns a point for drawing a graph showing that the air temperature was decreasing as the fog formed and increasing as the fog began to dissipate.

Part C

Variable for vertical axis of Graph C:

Options:
- Air temperature
- Amount of cloud cover
• Proportion of carbon dioxide in air in liquid form
• Proportion of oxygen in air
• Proportion of water in air in gas form
• Sunlight intensity

Answer:
Part C

Variable for vertical axis of Graph C: proportion of water in air in gas form

The student earns a point for drawing a graph showing the proportion of water vapor in the air decreasing as the fog formed and increasing as it dissipated.

The student earns a point for drawing a decrease in each of the causal factors in Graphs A-C.

Note – the student may construct the graphs in any order and earn full credit, as long as they choose the correct causal factors and construct the graphs correctly.

Part D

Click each box and select a word or phrase to complete the sentence describing why fog appears and disappears during the course of the day.

A change in __________ causes a change in __________, which in turn causes a change in __________.

Options:
• Air temperature
• Amount of cloud cover
• Proportion of carbon dioxide in air in liquid form
• Proportion of oxygen in air
• Proportion of water in air in gas form
• Sunlight intensity
Answer:

Part D

Click each box and select a word or phrase to complete the sentence describing why fog appears and disappears during the course of the day.

A change in sunlight intensity\text{\textup{\textbullet\textbullet\textbullet\textbullet\textbullet}}\text{\textbullet\textbullet\textbullet\textbullet\textbullet} causes a change in air temperature\text{\textup{\textbullet\textbullet\textbullet\textbullet\textbullet}}, which in turn causes a change in proportion of water in air in gas form\text{\textup{\textbullet\textbullet\textbullet\textbullet\textbullet}}.
Item 2

Alignment: MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.
  - SEP: Analyzing and Interpreting Data
  - DCI: ESS1.B: Earth and the Solar System
  - CCC: Scale, Proportion and Quantity

Part A

Use the measuring tool in the animation to determine each moon’s maximum distance from Jupiter.

Complete the table by entering measurements to the closest 0.5 centimeter (cm) in the blank boxes.

<table>
<thead>
<tr>
<th></th>
<th>Maximum Distance from Jupiter in Animation (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td></td>
</tr>
</tbody>
</table>

Answer:
  - The student earns a point for entering a value between 3.5 and 4.5 cm for Moon 1 (M1)
  - The student earns a point for entering a value between 1.0 and 2.0 cm for Moon 2 (M2)
  - The student earns a point for entering a value between 6.5 and 7.5 cm for Moon 3 (M3)
  - The student earns a point for entering a value between 2.0 and 3.0 cm for Moon 4 (M4)

Part B

Using the data in Table 1 and your answers in part A, select the boxes to identify each moon by name.

<table>
<thead>
<tr>
<th></th>
<th>Callisto</th>
<th>Europa</th>
<th>Ganymede</th>
<th>Io</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Answer:
Part B

Using the data in Table 1 and your answers in part A, select the boxes to identify each moon by name.

<table>
<thead>
<tr>
<th></th>
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<th>Europa</th>
<th>Ganymede</th>
<th>Io</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td></td>
<td></td>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td></td>
<td>🟢</td>
<td></td>
<td>🟢</td>
</tr>
<tr>
<td>M3</td>
<td>🟢</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td></td>
<td>🟢</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part C

M1 and M4 appear to intersect twice in the model.

Enter the approximate distance, in kilometers (km), from Jupiter, where one of these apparent intersections occur.

\[(km)\]

Answer:
- The student entered a value between 100,000 – 200,000 km or between 600,000 – 700,000 km.

Part D

Compare the measurements you took in part A and part C to the data in Table 1.

Which statement is true about the two measurements?

- A. The measurements you took are proportional to the data in the table.
- B. The measurements you took are not proportional to the data in the table because the table is wrong.
- C. There is not enough information to tell whether the measurements you took are proportional to the data in the table.
- D. The data you measured is not proportional to the data in the table because the ruler on the lens is not accurate at that distance.

Answer:
- The data you measured is not proportional to the data in the table because the ruler on the lens is not accurate at that distance.
Part E

Which relationship between properties of the moons is supported by the data?

A  Diameter is related to orbit size.
B  Orbital period is related to orbit size.
C  Diameter is related to the orbital period.
D  Orbital period is related to diameter and orbit size.

Answer:
  •  Orbital period is related to orbit size.
Item 3

Alignment: MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and the seasons.

- SEP: Developing and Using Models
- DCI: ESS1.A: The Universe and Its Stars
- CCC: Patterns

In December, it is winter in Reykjavik, Iceland, but summer in Salvador, Brazil. Figure 1 shows an illustration of the position of Earth around the sun in December.

The four illustrations show Earth in different positions in its revolution around the sun. The frame of reference for all of the illustrations is the same.

Which illustration shows autumn in Reykjavik (R) and spring in Salvador (S)?

A

B
Answer: D
Item 4

Alignment: MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
- SEP: Engaging in Argument from Evidence
- DCI: PS3.B: Conservation of Energy and Energy Transfer
- CCC: Energy and Matter

Part A

Click on each blank box to select the word or phrase that completes each sentence, constructing an argument about what happens when the train’s brakes are applied.

Applying the brakes causes the _______ to transfer kinetic energy to the _______. This causes the _______ to slow down and have _______ kinetic energy, which slows the train.

Options:
- Dropdowns 1-3:
  - Wheels
  - Brakes
  - Rails
- Dropdown 4:
  - Less
  - More
  - The same

Answer:
- 1 point: The student selected “wheels” in the first blank and “brakes” or “rails” in the second blank.
- 1 point: The student selected “wheels” in the third blank and “less” in the fourth blank.

Part B

When the train applies its brakes, what happens to the energy of the surroundings?

A. The surroundings gain energy.
B. The surroundings lose energy.
C. The surroundings do not gain or lose energy.
D. There is not enough information to determine the energy of the surroundings.

Answer:
- A. The surroundings gain energy
Part C

Which **three** statements support your choice in part B?

- The train maintains its speed.
- Sound is produced.
- Sound is consumed.
- Light is produced.
- Light is consumed.
- Heat is produced.
- Heat is consumed.

**Answers:**
- Sound is produced.
- Light is produced.
- Heat is produced.

Part D

Select **three** pieces of evidence that would support the claim that the kinetic energy of the wheels changed form.

- The brakes give off energy as heat.
- The brakes make a screeching sound.
- The brakes undergo a chemical reaction.
- The sparks that fly off the wheels give off light.
- The potential energy of the train increases as it slows.

**Answers:**
- The brakes give off energy as heat.
- The brakes make a screeching sound.
- The sparks that fly off the wheels give off light.
Item 5

**Alignment:** MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

- **SEP:** Planning and Carrying out Investigations
- **DCI:** PS3.A: Definitions of Energy
- **CCC:** Scale, Proportion and Quantity

An ice cream company wants to know what kind of containers keep ice cream frozen the longest. Design an experiment to determine the **best** container to keep ice cream cold.

Click on the boxes in the table to identify the independent variable, dependent variable, and the factors that are held constant in your experiment. Be sure to complete each row.

<table>
<thead>
<tr>
<th>Table 1. Ice Cream Experiment Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
</tr>
<tr>
<td>Container size</td>
</tr>
<tr>
<td>Type of ice cream</td>
</tr>
<tr>
<td>Container material</td>
</tr>
<tr>
<td>Amount of time to melt</td>
</tr>
<tr>
<td>Temperature outside the container</td>
</tr>
</tbody>
</table>

**Options:**

- Held constant
- Dependent variable
- Independent variable

**Answers:**

- The student earns one point for selecting only one variable as the independent variable and leaving no rows blank.
- The student earns one point for selecting only one variable as the dependent variable and leaving no rows blank.
- The student earns one point for selecting either “Container size” or “Container material” as the independent variable and leaving no rows blank.
- The student earns one point for selecting “Amount of time to melt” as the dependent variable and leaving no rows blank.
Item 6

**Alignment:** MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- **SEP:** Engaging in Argument from Evidence
- **DCI:** LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- **CCC:** Stability and Change

**Part A**

Click on each box and select a word/phrase that completes the table with the Yellowstone population data from 1995 and 2004 and the hypothesis those data support.

<table>
<thead>
<tr>
<th>Data</th>
<th>Hypothesis Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elk population</td>
<td></td>
</tr>
<tr>
<td>Beaver population</td>
<td></td>
</tr>
<tr>
<td>Mule deer population</td>
<td></td>
</tr>
</tbody>
</table>

**Options:**

- **Data**
  - Increased
  - Decreased
  - Had no change
- **Hypothesis supported**
  - Supports hypothesis 1
  - Supports hypothesis 2
  - Supports both hypotheses
  - Supports neither hypothesis

**Answer:**

<table>
<thead>
<tr>
<th>Data</th>
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<tr>
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</tr>
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<td>Mule deer population</td>
<td>had no change</td>
</tr>
</tbody>
</table>
**Part B**

Which hypothesis is best supported by the evidence?

- (A) All of the evidence is consistent with Hypothesis 1.
- (B) All of the evidence is consistent with Hypothesis 2.
- (C) Most of the evidence is consistent with Hypothesis 1.
- (D) Most of the evidence is consistent with Hypothesis 2.
- (E) The evidence does not favor either hypothesis.

**Answer:** C. Most of the evidence is consistent with Hypothesis 1.

**Part C**

Aspen trees are shown in Diagram 1. Moose and bison are two plant-eating animal species that are not shown in Diagram 1 but are also part of the Yellowstone food web.

Based on Hypothesis 2, click on each box to select a word/phrase to make a prediction about what would happen to the moose, bison, and aspen tree populations after the reintroduction of wolves.

**Table 3. Population Predictions**

<table>
<thead>
<tr>
<th>Species</th>
<th>Population after Wolf Reintroduction</th>
<th>Reason for Impact on Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moose</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>Bison</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>Aspen tree</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

**Options:**

- Population after Wolf Reintroduction
  - Increases
  - Decreases
  - Stayed the Same
- Reason for Impact on Population
  - Preyed on by wolves
  - It has the same prey as wolves
  - Its consumers are preyed on by wolves
  - It is not preyed on by wolves

**Answer:**
Table 3. Population Predictions

<table>
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<td>Bison</td>
<td>decrease</td>
<td>preyed on by wolves</td>
</tr>
<tr>
<td>Aspen tree</td>
<td>increase</td>
<td>its consumers are preyed on by wolves</td>
</tr>
</tbody>
</table>

**Part D**

Based on Hypothesis 1, and the information in Diagram 1, Table 1, and Table 3 from part C, click on each box to select **two** different predictions.

Table 4. Population Predictions

<table>
<thead>
<tr>
<th>Prediction Number</th>
<th>Prediction Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Options:
- Willows would grow in more places throughout the park
- Willows would have more leaves on each plant
- The aspen population would increase
- Aspen would have more leaves on each tree

Answer: these answers can appear in any order

Table 4. Population Predictions

<table>
<thead>
<tr>
<th>Prediction Number</th>
<th>Prediction Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Willows would grow in more places throughout the park.</td>
</tr>
<tr>
<td>2</td>
<td>The aspen population would increase.</td>
</tr>
</tbody>
</table>
Item 7

Alignment: MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

- **SEP**: Developing and Using Models
- **DCI**: LS3.B Variation of Traits
- **CCC**: Structure and Function

Flies with bar-eyed phenotypes cannot see as well as those with wild type phenotypes.

The genotypes and phenotypes of three flies are shown in Figure 1.

![Figure 1. Genotypes and Phenotypes of Three Flies](source)

Click on each blank box to select the statements that complete the chain of events explaining how the bar-eyed mutation reduces a fly’s eyesight.

**Chain of Events**

<table>
<thead>
<tr>
<th>Step</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The eyesight of a fly is reduced.</td>
</tr>
</tbody>
</table>

**Options:**
- The fly’s eye structures become wider.
- The fly’s eye structures become narrower.
- There is a change in the protein production.
- There is no change in the protein production.
- A chromosome has less than one copy of the B gene.
- A chromosome has more than one copy of the B gene.

**Answers:**

- The student earns one point for selecting “A chromosome has more than one copy of the B gene” before “There is a change in the protein production”.
- The student earns one point for selecting “There is a change in the protein production” before “The fly’s eye structures become narrower”.

**Chain of Events**

<table>
<thead>
<tr>
<th>Step</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A chromosome has more than one copy of the B gene.</td>
</tr>
<tr>
<td>2</td>
<td>There is a change in the protein production.</td>
</tr>
<tr>
<td>3</td>
<td>The fly’s eye structures become narrower.</td>
</tr>
<tr>
<td>4</td>
<td>The eyesight of a fly is reduced.</td>
</tr>
</tbody>
</table>
Item 8

**Alignment:** MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

- **SEP:** Obtaining, Evaluating and Communicating Information
- **DCI:** PS1.B Chemical Reactions
- **CCC:** Structure and Function

Ammonia is a colorless gas with a distinct odor. It is produced naturally in the human body and can be found in nature, in water, soil, air, and bacteria.

A student wants to know about the natural and synthetic sources and uses of ammonia and looks at the following three sources.

**Source 1**

“Ammonia and the Environment” published by iiar, May 2008. (adapted from original)

Ammonia is a naturally occurring compound essential for many biological processes. Ammonia is found at low concentrations in soil. Nitrogen fixation is the process whereby atmospheric nitrogen gas is converted to ammonia, which is then assimilated by plants into amino acids.

**Source 2**

“Ammonia: Production and Storage” published by National Program on Technology Enhanced Learning, July 2012. (adapted from original)

Natural gas is used in the production of ammonia. Natural gas molecules are broken into carbon and hydrogen. The hydrogen is reacted with nitrogen at high temperature and pressure to form ammonia. Approximately 83% of ammonia is used as fertilizers. Fertilizers are essential in today’s agricultural system to replace the elements extracted from the soil and increase food production.

**Source 3**

“How a century of ammonia synthesis changed the world” published by Nature Geoscience, September 2008. (adapted from original)

As nitrogen fertilizer was introduced into the farming process, the world population increased at a faster rate. More infrastructure options still need to be made in order to provide more nitrogen fertilizer to different environments.
Ammonia is a naturally occurring compound essential for many biological processes.

Ammonia is found at low concentrations in soil.

Nitrogen fixation is the process whereby atmospheric nitrogen gas is converted to ammonia, which is then assimilated by plants into amino acids.

Natural gas is used in the production of ammonia.

Natural gas molecules are broken into carbon and hydrogen.

The hydrogen is reacted with nitrogen at high temperature and pressure to form ammonia.

Approximately 83% of ammonia is used as fertilizers.

Fertilizers are essential in today’s agricultural system to replace the elements extracted from the soil and increase food production.

As nitrogen fertilizer was introduced into the farming process, the world population increased at a faster rate.

More infrastructure options still need to be made in order to provide more nitrogen fertilizer to different environments.

The student earns one point for selecting “Fertilizers are essential in today’s agricultural system to replace the elements extracted from the soil and increase food production” as a piece of evidence.

The student earns one point for selecting “As nitrogen fertilizer was introduced into the farming process, the world population increased at a faster rate” as a piece of evidence.

Combination 1:

Fertilizers are essential in today’s agricultural system to replace the elements extracted from the soil and increase food production.

As nitrogen fertilizer was introduced into the farming process, the world population increased at a faster rate.

Combination 2:
As nitrogen fertilizer was introduced into the farming process, the world population increased at a faster rate.

Fertilizers are essential in today’s agricultural system to replace the elements extracted from the soil and increase food production.