Grade 8 Science

Paper Practice Resource for Students
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The Colorado Measures of Academic Success (CMAS) is Colorado’s standards-based assessment program designed to measure the Colorado Academic Standards (CAS) in the content areas of science, social studies, English language arts, and mathematics. The sample items included in this resource provide students with an opportunity to become familiar with the format of test items that appear in the paper-based test books. The sample items are not intended to be a complete test, nor are they intended to cover all assessed content or item types.

While the use of the sample items is not required, it is strongly encouraged to help ensure students are familiar with the types of items they may encounter while taking the paper-based test.

**Item Types:**

**Selected Response Items**

Selected response items are multiple choice questions. To respond, the student indicates their response by filling in the circle(s) next to their answer choice.

<table>
<thead>
<tr>
<th>Correct Mark:</th>
<th>Incorrect Marks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ ☐ ☐ ☐</td>
<td>☑ X ☐ ☐ ☐</td>
</tr>
</tbody>
</table>

**Constructed Response Items**

Constructed response items are questions or prompts that require an independent, written response. To respond, the student writes his or her answer in the response box in the test book.
**Converted Online Technology-Enhanced Item Types**

Online technology-enhanced items converted to the paper testing format may ask students to:

- Circle the correct answer
- Complete a table with checkmarks, Xs, or letters from a list of answer choices
- Fill in the blank
- Draw lines from boxes to correct answers
- Complete a bar graph or histogram

**Simulations**

Simulations include groups of items that relate to a scientific topic. The information needed to respond appears before the associated items.
ITEM SET 1
1. Students performed an investigation on the motion of an object. The graph shows data they recorded from their investigation.

Which statement best describes the motion of the object plotted in the graph?

- A) The object accelerated because the distance traveled increased at a steady rate.
- B) The object traveled at a constant speed because of forces acting on the object.
- C) The object accelerated because it traveled in the same direction throughout the investigation.
- D) The object slowed down as it traveled uphill because of the forces acting on the object.
2. The picture shows an investigation and the data that were recorded in a student’s lab notebook.

Circle **two** pieces of data from the lab notebook that show matter is conserved in this investigation.

**Student’s Lab Notebook**

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mass (g)</strong></td>
<td>471</td>
<td>471</td>
</tr>
<tr>
<td><strong>Temperature of Test Tube B (°C)</strong></td>
<td>21.4</td>
<td>19.8</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>clear liquid and light blue liquid</td>
<td>blue liquid + dark blue solid (precipitate)</td>
</tr>
</tbody>
</table>
3. A stream that runs into a lake cuts across a crop field. A new fertilizer is used in the field that has increased the nitrogen and phosphorus concentrations of the soil.

How will these increased nitrogen and phosphorus concentrations affect the ecosystem of the lake?

- increase in shorebird nesting
- increase in algae population
- increase in fish population
- increase in oxygen concentration

4. Put the steps in order.

Write a letter in each box to show the sequence of events in a trait being passed down from parent to offspring through sexual reproduction.

A. The fertilized cell begins to divide.
B. The gamete cells combine through fertilization.
C. The cells of the offspring express the trait.
D. Parent gamete cells contain the alleles for trait.
5. Which Punnett square correctly shows the results of a cross between a heterozygous parent and a homozygous recessive parent?

A

\[
\begin{array}{ll}
B & Bb \\
\hline
b & bb
\end{array}
\]

B

\[
\begin{array}{ll}
B & Bb \\
\hline
b & bb
\end{array}
\]

C

\[
\begin{array}{ll}
B & BB \\
\hline
b & bb
\end{array}
\]

D

\[
\begin{array}{ll}
B & BB \\
\hline
b & BB
\end{array}
\]
6. The picture shows a Dalmatian dog. Draw a line to connect each trait from the list on the left to either the box for “Inherited traits” or the box for “Non-inherited traits.”
Directions: Study the Light Bulb passage to answer questions 7 through 10.

A scientist compared the energy transfers for different types of light bulbs—incandescent, compact fluorescent (CFL), and light-emitting diodes (LED). The test was performed using the setup shown in the diagram.
Each bulb was tested at three different brightnesses: dim, bright and very bright. The results are shown in the table.

<table>
<thead>
<tr>
<th>Type of Bulb</th>
<th>Brightness</th>
<th>Watts (W)</th>
<th>Lumens</th>
<th>Lumens per Watt</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent</td>
<td>Dim</td>
<td>40</td>
<td>450</td>
<td>11</td>
<td>115</td>
</tr>
<tr>
<td>Incandescent</td>
<td>Bright</td>
<td>60</td>
<td>800</td>
<td>13</td>
<td>118</td>
</tr>
<tr>
<td>Incandescent</td>
<td>Very Bright</td>
<td>75</td>
<td>1,100</td>
<td>15</td>
<td>125</td>
</tr>
<tr>
<td>CFL</td>
<td>Dim</td>
<td>10</td>
<td>520</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>CFL</td>
<td>Bright</td>
<td>13</td>
<td>825</td>
<td>63</td>
<td>51</td>
</tr>
<tr>
<td>CFL</td>
<td>Very Bright</td>
<td>26</td>
<td>1,750</td>
<td>67</td>
<td>54</td>
</tr>
<tr>
<td>LED</td>
<td>Dim</td>
<td>9</td>
<td>450</td>
<td>50</td>
<td>37</td>
</tr>
<tr>
<td>LED</td>
<td>Bright</td>
<td>13</td>
<td>800</td>
<td>62</td>
<td>38</td>
</tr>
<tr>
<td>LED</td>
<td>Very Bright</td>
<td>15</td>
<td>950</td>
<td>63</td>
<td>39</td>
</tr>
</tbody>
</table>
7. The electromagnetic waves seen in this investigation are best described as which type of wave?

A) ultraviolet light
B) gamma rays
C) visible light
D) x-rays

8. Notice the change in temperature that occurs with each of the three incandescent light bulbs’ brightness. Based on the results, which of the following temperature ranges is most likely for a 100-watt incandescent light bulb after it has been lit?

A) less than 115°C
B) between 115°C and 118°C
C) between 118°C and 125°C
D) greater than 125°C
9. Use the information from the passage to analyze how the wattage of the LED light bulb affects the heat it emits. Describe the relationship between light bulb wattage and heat released for the three LED light bulb brightnesses. Identify specific temperature data from the passage to support your answer.
10. Review the data for each light bulb at the bright setting in the data table.

Which light bulb is least efficient at transferring energy into a form that can be used to light a room? Use data to explain your answer.
11. Identify the parts of the food chain that will **most likely** be negatively affected if insecticides are applied to the producers.

Select all answers that apply.

- [ ] Sun
- [ ] Grass
- [ ] Grasshopper
- [ ] Shrew
- [ ] Owl
12. A model of Earth, the Moon, and the Sun is shown. 

Which movement of the model displays an event that takes about 28 days?

- Earth rotates once on its axis.
- The Moon revolves once around the Sun.
- The Sun rotates once on its axis.
- The Moon revolves once around Earth.
13. Suppose a new type of plant is discovered with the following characteristics:

- Rapid reproduction
- Offspring genetically identical to parent
- New plant grows from the root of existing plant

How does this type of plant **most likely** reproduce, asexually or sexually? Explain your answer based on the information given about the organism.
14. The data table shows some characteristics of the North Pole and the South Pole.

<table>
<thead>
<tr>
<th></th>
<th>Average Summer Temperature (°C)</th>
<th>Average Winter Temperature (°C)</th>
<th>Average Annual Precipitation (mm)</th>
<th>Average Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Pole</td>
<td>0</td>
<td>-40</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td>South Pole</td>
<td>-28</td>
<td>-60</td>
<td>4.5</td>
<td>2,300</td>
</tr>
</tbody>
</table>

- Based on the data in the table, explain a likely reason why the South Pole has lower temperatures than the North Pole.
- Describe how scientists can gather evidence to support the reason you gave.
15. Describe how the climate in the tropics is different from Colorado. In your description include: amount of available sunlight, amount of precipitation, and location on the globe.

This is the end of Item Set 1.
ITEM SET 2
1. The picture shows students eating a picnic lunch. Which table correctly identifies the chemical changes and physical changes that are occurring?

![Diagram of students eating with labels for chemical and physical changes]

<table>
<thead>
<tr>
<th>Chemical change</th>
<th>Physical change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digesting food</td>
<td>Ice melting in glass</td>
</tr>
<tr>
<td>Condensation on glass</td>
<td></td>
</tr>
<tr>
<td>Apple slices turning brown</td>
<td></td>
</tr>
</tbody>
</table>

- **A**

<table>
<thead>
<tr>
<th>Chemical change</th>
<th>Physical change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digesting food</td>
<td>Ice melting in glass</td>
</tr>
<tr>
<td>Condensation on glass</td>
<td></td>
</tr>
<tr>
<td>Apple slices turning brown</td>
<td></td>
</tr>
</tbody>
</table>

- **B**

<table>
<thead>
<tr>
<th>Chemical change</th>
<th>Physical change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice melting in glass</td>
<td></td>
</tr>
<tr>
<td>Condensation on glass</td>
<td></td>
</tr>
<tr>
<td>Apple slices turning brown</td>
<td></td>
</tr>
</tbody>
</table>

- **C**

<table>
<thead>
<tr>
<th>Chemical change</th>
<th>Physical change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice melting in glass</td>
<td></td>
</tr>
<tr>
<td>Condensation on glass</td>
<td></td>
</tr>
<tr>
<td>Apple slices turning brown</td>
<td></td>
</tr>
</tbody>
</table>

- **D**

<table>
<thead>
<tr>
<th>Chemical change</th>
<th>Physical change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice melting in glass</td>
<td></td>
</tr>
<tr>
<td>Condensation on glass</td>
<td></td>
</tr>
<tr>
<td>Apple slices turning brown</td>
<td></td>
</tr>
</tbody>
</table>

- **D**

<table>
<thead>
<tr>
<th>Chemical change</th>
<th>Physical change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice melting in glass</td>
<td></td>
</tr>
<tr>
<td>Condensation on glass</td>
<td></td>
</tr>
<tr>
<td>Apple slices turning brown</td>
<td></td>
</tr>
</tbody>
</table>

- **D**
2. Which of these is **most likely** part of an action plan for people who have been warned of a heat advisory?

- (a) lie down on the ground in a ditch or other low area
- (b) stay in an interior room of a well-constructed building
- (c) seek high ground away from rivers and streams
- (d) drink plenty of fluids and wear light-colored clothing
3. A student releases a skateboard down a ramp. The student records the following information about the skateboard.

Explain the forces acting on the skateboard and how the forces affect the motion of the skateboard.
4. The diagram shows the operational setup of a dry steam power plant and how energy is provided to residents.

Which energy transformation **best** applies to the dry steam power plant and the energy provided to residents?

- A  heat → electrical → mechanical
- B  heat → mechanical → electrical
- C  light → electrical → mechanical
- D  mechanical → heat → light
5. A website provides the map shown. The four numbered locations identify different climates on Earth. Draw a line to connect each numbered location to the box that best describes its climate.
The table shows some data collected about objects in the solar system.

### Planetary Data*

<table>
<thead>
<tr>
<th>Planet</th>
<th>Orbital Period(^1) (days)</th>
<th>Orbital Velocity(^2) (km/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>88.0</td>
<td>47.9</td>
</tr>
<tr>
<td>Venus</td>
<td>224.7</td>
<td>35.0</td>
</tr>
<tr>
<td>Earth</td>
<td>365.2</td>
<td>29.8</td>
</tr>
<tr>
<td>Mars</td>
<td>687.0</td>
<td>24.1</td>
</tr>
<tr>
<td>Jupiter</td>
<td>4,331</td>
<td>13.1</td>
</tr>
<tr>
<td>Saturn</td>
<td>10,747</td>
<td>9.7</td>
</tr>
<tr>
<td>Uranus</td>
<td>30,589</td>
<td>6.8</td>
</tr>
<tr>
<td>Neptune</td>
<td>59,800</td>
<td>5.4</td>
</tr>
</tbody>
</table>

*Numerical data based on NASA information.

\(^1\)Orbital Period (days)—This is the time in Earth days that it takes for the planet to orbit the Sun.

\(^2\)Orbital Velocity (km/s)—This is the average velocity, or speed, of the planet, in kilometers per second, as it orbits the Sun.

Explain the relationship between orbital periods and distance from the Sun. Explain the relationship between orbital velocities and distance from the Sun.
7. Draw a line connecting each diagram of a wave property to the name of the wave property.

Wave amplitude

Wavelength

Wave frequency
Directions: Study the Borneo Deforestation stimulus to answer question 8.

Students investigated the rate of deforestation on the island of Borneo. Their results are shown in the table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Average Annual Harvest (cubic meters)</th>
<th>Map of Deforestation (forested areas are shaded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>negligible (insignificant amount)</td>
<td><img src="image" alt="Map of Borneo in 1950" /></td>
</tr>
<tr>
<td>1985</td>
<td>1,700,000,000</td>
<td><img src="image" alt="Map of Borneo in 1985" /></td>
</tr>
<tr>
<td>2005</td>
<td>12,000,000,000</td>
<td><img src="image" alt="Map of Borneo in 2005" /></td>
</tr>
<tr>
<td>2010</td>
<td>3,700,000,000</td>
<td><img src="image" alt="Map of Borneo in 2010" /></td>
</tr>
</tbody>
</table>
8. Explain how deforestation most likely affected the survival rates of local animals. Support your answer with information from the data table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Animal Species</th>
<th>Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>Monkey</td>
<td>90%</td>
</tr>
<tr>
<td>2010</td>
<td>Elephant</td>
<td>70%</td>
</tr>
<tr>
<td>2020</td>
<td>Tiger</td>
<td>50%</td>
</tr>
</tbody>
</table>
Directions: Study the Borneo Deforestation stimulus to answer questions 9 through 11.

The students also analyzed the causes and effects of deforestation on Borneo and created a graphic organizer to display their information.
9. A student reads the following excerpt from an article.

“Deforestation has positive benefits to the ecosystem and helps to meet the needs of humans.”

Which concepts in the graphic organizer most likely support this position?

- building materials and food productivity
- increased agriculture and habitat destruction
- local climate change and species extinction
- decreased biodiversity and lost medical discoveries

10. Using the information provided in the diagram, explain how human population growth can affect deforestation.
11. The graphic organizer shows that deforestation can cause a change in precipitation patterns, resulting in local climate change. Which will result from a change in precipitation amounts?

- a change in the order of the steps of the water cycle
- a change in the process of photosynthesis in plants
- a change in the type of vegetation growing in the area
- a change in the way greenhouse gases are formed
12. Which statement describes how one part of the solar system most likely formed?

- A. The Sun formed from a large collection of particles at the center of the solar nebula.
- B. Earth formed from the nucleus of a large comet merging with a meteor.
- C. Jupiter formed from the collision of two asteroids.
- D. The Moon formed from a cloud of gases.

13. A student writes down definitions that represent characteristics of sound waves.

1. distance between two consecutive crests
2. low point of a wave
3. high or low sound
4. number of complete waves per unit time

Which two definitions can be used to describe pitch and frequency?

- A. 1 and 3
- B. 2 and 3
- C. 2 and 4
- D. 3 and 4
TURN THE PAGE AND CONTINUE WORKING
14. The picture shows a prototype of a solar-powered car that has panels on its roof. The panels tilt to follow the movement of the Sun. This tilting function was absent in previously designed solar-powered cars.
Discuss the energy transformations in solar-powered cars that put the car in motion and predict how the tilting function will affect the amount of energy collected and transferred.
15. The chart shows information about different climate regions.

<table>
<thead>
<tr>
<th>Climate Regions</th>
<th>Annual Temperature Range</th>
<th>Annual Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperate grassland</td>
<td>-40°C to 38°C</td>
<td>50 to 90 cm</td>
</tr>
<tr>
<td>Desert</td>
<td>20°C to 25°C</td>
<td>less than 25 cm</td>
</tr>
<tr>
<td>Tundra</td>
<td>-28°C to 16°C</td>
<td>10 to 25 cm</td>
</tr>
<tr>
<td>Taiga</td>
<td>-54°C to 21°C</td>
<td>30 to 85 cm</td>
</tr>
</tbody>
</table>

Which biome is best suited for plants that grow well in cold, dry climates?

- A) temperate grassland
- B) desert
- C) tundra
- D) taiga

This is the end of Item Set 2.
ITEM SET 3
1. The thermometers show the day’s high and low temperatures for Eagle, Colorado.

The graph shows the average monthly temperatures for Eagle.

Based on the thermometers and the graph, in which month does this day **most likely** occur?

- April
- December
- June
- September
2. Which of these is an example of a physical change?

- wood burned into ash
- baking soda mixed with vinegar
- rock salt broken into smaller pieces
- sugar in plants made by photosynthesis

3. A student collects data before and after a certain amount of snow melts. The types of data the student collects are:

- mass in grams (g)
- volume in cubic centimeters (cm³)
- temperature in degrees Celsius (ºC)
- state of matter

Identify which data the student collects that best show matter was conserved in this investigation. Explain your answer.
A tall pea plant (Tt) crosses with another tall pea plant (Tt) to produce 100 seeds. Complete the bar graph with the **most likely** number of offspring for all three genotypes.
5. A researcher measures and records the temperature of the brakes when a car stops at different speeds.

What form of energy transfer does this data show?

- from mechanical energy to potential energy
- from potential energy to thermal energy
- from kinetic energy to potential energy
- from kinetic energy to thermal energy
6. Scientists placed two organisms (Parent X and Parent Y) that can reproduce both asexually or sexually together in a laboratory. The genes of their offspring (Offspring A–D) were compared to the parent organisms’ genes. The table lists the number of genes shared by the four offspring with each parent.

<table>
<thead>
<tr>
<th>Number of Genes Shared</th>
<th>Parent X</th>
<th>Parent Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offspring A</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Offspring B</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Offspring C</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Offspring D</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
Identify which of the offspring resulted from asexual reproduction. Explain your answer using data from the table.
7. Observe the comet’s revolution around the Sun.

Circle the word(s) that complete the sentences.

As the comet moves closer and farther away from the Sun, its speed changes. This is due to the Sun’s __________.

- volume
- gravity
- temperature

If the Sun’s mass was larger, the comet would most likely move __________.

- at the same speeds shown in the diagram
- slower than shown in the diagram
- faster than shown in the diagram
Directions: Study the Barometer stimulus to answer questions 8 through 11.

The diagrams show how two weather fronts cause barometric pressure changes as they approach an area of the central United States over several days.
8. How can the information in the passage be used?

- to predict sea levels
- to forecast atmospheric conditions
- to measure ocean temperatures
- to analyze allergen levels

9. In the first scenario shown in the passage, observe the point where the fronts intersect.

Predict the weather conditions at the point as the fronts intersect. If people are participating in outdoor activities at the time this weather system is occurring, what actions should the people take in response to these weather conditions?
10. In the second scenario shown in the passage, front A passes over the point on the map. Then, a few days later, front B passes over the same point. Which of these shows the sequence of temperatures at this point over the days it took the fronts to pass?

- warm → cool → cold
- warm → warmer → cool
- warm → cold → colder
- warm → cool → warm

11. As front A approaches the area marked on the maps, describe how the weather in that area will most likely change over the next day. Discuss both relative temperature and cloud cover in our answer. Include data from the barometer to justify your answer.
TURN THE PAGE AND CONTINUE WORKING
12. The map shows the location of two cities in Colorado.

The tables show monthly and annual average temperatures for the cities Greeley and Trinidad.

**Greeley Climate Data**

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Apr</th>
<th>Jul</th>
<th>Oct</th>
<th>Annual Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average High Temperature (°F)</td>
<td>40.0</td>
<td>63.0</td>
<td>88.7</td>
<td>66.0</td>
<td>64.18</td>
</tr>
<tr>
<td>Average Low Temperature (°F)</td>
<td>15.6</td>
<td>35.8</td>
<td>59.3</td>
<td>36.9</td>
<td>37.03</td>
</tr>
</tbody>
</table>
### Trinidad Climate Data

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Apr</th>
<th>Jul</th>
<th>Oct</th>
<th>Annual Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average High Temp.</strong></td>
<td>46.4</td>
<td>65.2</td>
<td>89.1</td>
<td>68.7</td>
<td>67.06</td>
</tr>
<tr>
<td><strong>Average Low Temp.</strong></td>
<td>17.1</td>
<td>34.1</td>
<td>58.3</td>
<td>37.2</td>
<td>36.60</td>
</tr>
</tbody>
</table>

Based on the map and the tables, which statement **best** supports the following claim?

**At times, northern Colorado can be warmer than southern Colorado.**

- A. Greeley’s average high temperatures are cooler than those of Trinidad during some months of the year.
- B. Trinidad’s average high temperatures are cooler than those of Greeley during one month.
- C. Greeley’s average low temperatures are warmer than those of Trinidad during some months of the year.
- D. Trinidad’s average low temperatures are warmer than those of Greeley during one month.
13. A student looks at a diagram of the Sun, Earth, and Moon.

Describe the positions of the objects relative to one another during a solar eclipse and during a lunar eclipse.
TURN THE PAGE AND CONTINUE WORKING
14. The picture shows a setup for a student’s investigation.

LEGEND

A = Angle of Flashlight  
B = Angle of the light in the water
Circle the word(s) to complete the sentences.

In this investigation, the student is studying how light is __________ by water.

- absorbed
- reflected
- refracted

The independent variable (the variable changed by the student) is the __________________________.

- angle of the light in the water
- angle of the flashlight
- type of liquid

The dependent variable (the variable measured by the student) is the __________________________.

- angle of the light in the water
- angle of the flashlight
- type of liquid

15. A student runs 100 meters in 16 seconds. What is the student’s speed?

- A 0.16 m/s
- B 6.25 m/s
- C 84.0 m/s
- D 1600 m/s

This is the end of Item Set 3.