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<td><strong>Passage Title</strong></td>
<td>(if listed): Title of the passage(s) associated with this item.</td>
</tr>
<tr>
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<td>(if listed): Depth of Knowledge (cognitive complexity) is measured on a four-point scale. 1 = Recall; 2 = Skill/Concepts; 3 = Strategic Thinking; 3-4 = Strategic/Extended Thinking</td>
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</table>
Which diagram shows an example of how to produce electricity?

A

B

C

D
A student wants to make an electromagnet. Which items are needed?

- **A**: battery, heat source, copper wire
- **B**: magnet, copper wire, metal nail
- **C**: copper wire, metal nail, battery
- **D**: magnet, battery, heat source
The force of gravity pulls down on Carol’s house with a total force of 300,000 newtons.

The force of gravity on Carol’s house would be exactly twice as much if the house

A  were twice as tall
B  had twice as much mass
C  had twice as much volume
D  covered twice as much area
The sun’s mass is about 30 million times greater than the moon.

Why does the gravitational pull between Earth and the moon affect Earth’s tides more than the gravitational pull between Earth and the sun?

A  The moon is more dense than the sun.
B  The moon is closer to Earth than the sun.
C  The moon has phases, but the sun does not.
D  The moon orbits Earth, but the sun does not.
A classification key and a diagram of an organism are shown below.

**Classification Key**

```
1A. Only 1 cell ............... go to 2
1B. More than 1 cell .......... go to 3
2A. No nucleus ............... Eubacteria
2B. Has a nucleus ............ Protista
3A. Autotrophic ............. Plantae
3B. Heterotrophic ........... go to 4
4A. Mobile ................. Animalia
4B. Immobile ............... Fungi
```

The organism shown on the right belongs to what kingdom?

A  Eubacteria
B  Protista
C  Plantae
D  Animalia
A picture of an organism and a classification key are shown below.

**Classification Key**

1a. The organism has feathers ..........Class Aves  
1b. The organism has no feathers.......... Go to 2  

2a. The organism has scales.................. Go to 3  
2b. The organism has no scales ............. Go to 4  

3a. The organism has gills....Class Chondrichthyes  
3b. The organism has lungs..............Class Reptilia  

4a. The organism has fur...............Class Mammalia  
4b. The organism has no fur.............. Class Insecta  

Using the classification key above, identify the class of the organism.

- A  Class Aves  
- B  Class Reptilia  
- C  Class Chondrichthyes  
- D  Class Mammalia
The most available food source for birds on an island is hard-shelled nuts. Which birds have beaks designed to best survive on a diet of hard-shelled nuts?

A

B

C

D
The table below shows four different populations of bacteria and the percentage of each that is resistant to different antibiotics.

### Percent of Bacterial Population Resistant to Antibiotic

<table>
<thead>
<tr>
<th>Population</th>
<th>Antibiotic Q</th>
<th>Antibiotic R</th>
<th>Antibiotic S</th>
<th>Antibiotic T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.3%</td>
<td>17.1%</td>
<td>19.0%</td>
<td>30.1%</td>
</tr>
<tr>
<td>2</td>
<td>18.1%</td>
<td>46.9%</td>
<td>18.4%</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>0%</td>
<td>95.1%</td>
<td>1.6%</td>
<td>82.0%</td>
</tr>
<tr>
<td>4</td>
<td>0%</td>
<td>3.3%</td>
<td>6.6%</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

Which population of bacteria would have the greatest number of survivors if treated with Antibiotic S?

A 1
B 2
C 3
D 4
The diagram below shows layers of sedimentary rock and the types of fossils found in each layer.

What layer contains the oldest fossil?

A  Layer 1
B  Layer 2
C  Layer 3
D  Layer 4
Which represents the smallest part of an element that retains all the properties of that element?

A. molecule
B. atom
C. nucleus
D. proton

Recognize that all matter consists of atoms.
A table of chemical equations is shown below.

**Equations Table**

<table>
<thead>
<tr>
<th>Equation</th>
<th>Reactants</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaOH + KNO₃ → NaNO₃ + KOH</td>
<td>NaOH, KNO₃</td>
<td>NaNO₃, KOH</td>
</tr>
<tr>
<td>CH₄ + 2O₂ → CO₂ + 2H₂O</td>
<td>CH₄, O₂</td>
<td>CO₂, 2H₂O</td>
</tr>
<tr>
<td>2Fe + 6NaBr → 2FeBr₃ + 6Na</td>
<td>2Fe, 6NaBr</td>
<td>2FeBr₃, 6Na</td>
</tr>
<tr>
<td>Pb + O₂ → PbO₂</td>
<td>Pb, O₂</td>
<td>PbO₂</td>
</tr>
</tbody>
</table>

Which is a reactant in one of the equations?

A  NaNO₃  
B  CO₂   
C  PbO₂  
D  NaBr
A chemical equation is shown below.

\[ 4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 \]

The mass of \( 2\text{Fe}_2\text{O}_3 \) produced must be equal to

A  the total mass of \( 4\text{Fe} \) and \( 3\text{O}_2 \).

B  twice the total mass of \( 4\text{Fe} \) and \( 3\text{O}_2 \).

C  one-half the mass of \( 4\text{Fe} \) and \( 3\text{O}_2 \).

D  the mass of \( 4\text{Fe} \) less the mass of \( 3\text{O}_2 \).
The table below shows the pH values of some different foods.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Approximate pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg whites</td>
<td>7.96</td>
</tr>
<tr>
<td>Graham crackers</td>
<td>7.92</td>
</tr>
<tr>
<td>Cranberry juice</td>
<td>2.30</td>
</tr>
<tr>
<td>Conch snails</td>
<td>8.40</td>
</tr>
</tbody>
</table>

Based on its pH level, which kind of food is most likely to have a sour taste?

A  Egg whites
B  Graham crackers
C  Cranberry juice
D  Conch snails
A strip of litmus paper turns blue when placed in a liquid. This observation indicates that the liquid has the properties of

A  citrus juice.
B  pure water.
C  an acid.
D  a base.
After time, a copper penny will turn a green color and have a higher mass due to a chemical process. Which is the most likely reason for the changes to the copper penny?

A. Dirt is clinging to the copper penny.
B. The copper penny was painted.
C. Metal in the copper penny oxidizes.
D. The copper penny absorbed water.
Which is a compound?

A lead (Pb)

B sulfur (S)

C hydrogen peroxide (H₂O₂)

D oxygen gas (O₂)
A student examines a powder. He notices most of the powder is made of white grains, but black grains are also present. The powder should be classified as

A  an atom.
B  a mixture.
C  an element.
D  a compound.
Which of these particle arrangements best represents a gas?

A

C

D

B
The formula for density is shown below.

\[
D = \frac{m}{V}
\]

A substance has a mass of 12 grams and a volume of 6.0 cubic centimeters. What is the density of the substance?

A. 0.5 gram/cubic centimeter  
B. 2.0 grams/cubic centimeter  
C. 18 grams/cubic centimeter  
D. 72 grams/cubic centimeter
A teacher put five grams of each of the four different substances into individual test tubes and then heated each test tube over a flame. The teacher asked the students to note the appearance of each substance after heating. The results were as follows:

**Reaction of Substances Table**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Appearance Before Heating</th>
<th>Observations While Heating</th>
<th>Appearance After Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium permanganate</td>
<td>Purple crystalline solid</td>
<td>Crackling, black smoke</td>
<td>Black powder</td>
</tr>
<tr>
<td>Copper carbonate</td>
<td>Blue-green powder</td>
<td>Begins to turn black</td>
<td>Black solid</td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>White powder</td>
<td>Turns yellow</td>
<td>White powder</td>
</tr>
<tr>
<td>Sulfur</td>
<td>Yellow crystalline solid</td>
<td>Yellow-brown liquid, smells like rotten eggs</td>
<td>Yellow-brown liquid with large, fiber-like crystals</td>
</tr>
</tbody>
</table>

According to the data, which substance underwent a physical change?

A  Potassium permanganate
B  Copper carbonate
C  Zinc oxide
D  Sulfur
The diagram below shows the periodic table.

Which shaded element will chemically combine most easily with hydrogen (H)?

A  fluorine (F)
B  sulfur (S)
C  krypton (Kr)
D  tin (Sn)
The graph below was created as part of a classroom investigation to show how the average weekly temperature changed during a one-month period.

![Temperature Graph]

Which variable, if not controlled, will make this graph most unreliable?

A. The temperatures were measured at different times of the day.
B. A digital thermometer was used to collect data.
C. The temperatures are an average.
D. A cold front changed the weather.
The table shows the relationship between the percent of biodiesel used to operate machines and the reduction in carbon monoxide (CO) emissions.

<table>
<thead>
<tr>
<th>Percent of Biodiesel</th>
<th>Percent Reduction of CO Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>45</td>
</tr>
</tbody>
</table>

Which graph best shows the information from the table?

(This item continues on the next page.)
(Item 23, continued from the previous page)
A small plant was added to a closed jar where a cricket was kept. The table shows the oxygen \((O_2)\) and carbon dioxide \((CO_2)\) levels in the jar.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>CO₂</th>
<th>O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.04%</td>
<td>21.00%</td>
</tr>
<tr>
<td>2</td>
<td>0.02%</td>
<td>21.05%</td>
</tr>
<tr>
<td>4</td>
<td>0.03%</td>
<td>21.03%</td>
</tr>
<tr>
<td>6</td>
<td>0.04%</td>
<td>21.00%</td>
</tr>
</tbody>
</table>

Which statement is best supported by data in the table?

A  The plant was added between the times of 2 and 4 minutes.
B  The plant was added between the times of 4 and 6 minutes.
C  The plant absorbed \(O_2\) in the jar faster than the cricket breathed.
D  The cricket used \(CO_2\) at the same rate that the plant released it.
A train that is powered by magnetism and electricity is currently being tested in Japan. A student wants to build a model of this train.

Which test will best determine if the model train works?

A  attach the model train to an electric fan
B  connect the model train to a solar panel
C  attach the model train to a bottle rocket
D  connect the model train to an electromagnet
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