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Introduction

What is in this book?


There are three distinct sections in this workbook:

- **Introduction: Methods**
  This introduction provides you with methods to tackle test questions. Using the methods in this introduction, you will learn how to use the process of elimination, how to identify important information in the tests’ graphs, charts, and tables, as well as other skills that can help you succeed on tests. Carefully study the methods in this introduction before you begin the test questions in this workbook.

This workbook was written to accompany your textbook. For every chapter in your textbook, there are two types of tests in this workbook.

- **Chapter Test: Content Mastery**
  For every chapter in Science Level Green, this workbook contains a Chapter Test. Each Chapter Test is made up of multiple-choice questions designed to assess your knowledge and understanding of the material in the corresponding chapter of the textbook.

- **Standardized Test Practice: Test Preparation**
  For every chapter in Science Level Green, this workbook contains a corresponding Standardized Test Practice. The questions in this section are designed to prepare you for national science tests such as the TerraNova, the Iowa Tests of Basic Skills (ITBS), and the Stanford Achievement Test, Ninth Edition (SAT-9). The format of the questions found in these practice tests is very similar to the format of the questions found in the actual national science tests.
Task Regimen

A unique four-part Task Regimen and helpful Test-Taking Tips designed to maximize the benefits of using this workbook are presented in this section. Each of the four tasks is designed to help you identify challenges and improve your performance. Each task has an assignment for you to do on your own at home and one to do in class. Often the homework and the in-class activities will be coordinated, so it is important that you concentrate on both equally.

**At-Home Assignment**

**Task 1**

Using an answer key from the teacher, locate and review any questions you missed. Place a question mark beside any question you cannot figure out and bring it to class for discussion.

**Task 2**

For each question you missed, find the pages in the textbook that cover the material and explain what specific information was needed to answer the question correctly. If you cannot find any helpful information in the textbook, write out three questions about the test question that you did not understand.

**Task 3**

For every incorrect question, go through each answer choice and explain why it is correct or incorrect. Include any tips or hints you noticed that helped you eliminate choices. Place a question mark beside any question you cannot figure out and bring it to class for discussion.

**Task 4**

Your teacher will provide you with a list of questions to work on. For each question, make observations and write down all of the information given in the test in the form of a graphic, a passage, or otherwise. Write the information directly onto the test.

**In-Class Assignment**

The teacher administers the test in a realistic test-taking environment.

Work in a group to discuss any confusing questions and content areas. Then work through the confusing questions together.

Your teacher will lead a discussion for each question. Share your ideas and observations with the class. Keep notes of the discussion to help your review.

Work in a group to discuss each question. Make sure to note the location in the textbook where helpful information was found.
Test-Taking Tips

Test-Taking Tips for Before the Test:

1. Be sure to get plenty of sleep the week before the test. A healthy amount of sleep is 8–9 hours every night.

2. The night before the test, try to do something relaxing but stimulating, such as playing a board game, exercising, or reading an enjoyable book. Cramming the night before the test often can hamper your memory and make you tired.

3. The morning of the test, eat a healthy breakfast with fresh foods that are high in protein and carbohydrates.

4. The morning of the test, clear your mind of any outside distractions so that you will be better able to focus on the test. If breaks are given during the test, use that time to relax and clear your mind.

Test-Taking Tips for During the Test:

1. Listen to and read all directions.

2. Be sure you understand the question before reading the answer choices. Then, make sure to read and consider every answer choice.

3. Remember to carefully consider all the information presented in the test’s graphics.

4. If the test is timed, be sure to pace yourself.

5. Always choose an answer. By eliminating as many incorrect choices as possible, you will have a good chance at guessing correctly and obtaining more points.
1. According to this information, which halogen has a melting point greater than 0°C?
   a. Fluorine
   b. Chlorine
   c. Bromine
   d. Iodine

2. This picture shows an experiment used to determine which liquid will boil first. Which of the following would make this a better-designed experiment?
   f. Put a thermometer in each beaker
   g. Use the same amount of liquid in each beaker
   h. Cover each beaker with clear plastic
   j. Use a different size hotplate for each beaker

3. All of these activities are examples of safe laboratory practices EXCEPT _____.
   a. wearing safety goggles when using any source of heat
   b. handling any sharp instrument with extreme care
   c. keeping all lids closed when chemicals are not in use
   d. smelling a chemical directly from its container

4. Pierre did research about Earth’s crust. He found that it is about 8% aluminum, 28% silicon, 47% oxygen, and 17% other elements. Which area of the graph represents silicon?
   f. Q
   g. R
   h. S
   j. T
5. These data show the times of high tides for three days at a given location. If everything remains the same, at what time will high tide occur on Thursday morning?
   a. 5:19 A.M. 
   b. 6:19 A.M. 
   c. 7:19 A.M. 
   d. 8:19 A.M. 

<table>
<thead>
<tr>
<th>Day</th>
<th>High Tide in the Morning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>4:49 A.M.</td>
</tr>
<tr>
<td>Tuesday</td>
<td>5:39 A.M.</td>
</tr>
<tr>
<td>Wednesday</td>
<td>6:29 A.M.</td>
</tr>
<tr>
<td>Thursday</td>
<td>?</td>
</tr>
</tbody>
</table>

6. According to this information, which type of fish prefers the lowest water temperature?
   - f. Bass  
   - g. Goldfish  
   - h. Perch  
   - j. Salmon 

7. Which has been the greatest benefit of mandatory childhood immunization?
   - a. Developing a cure for AIDS  
   - b. Eliminating polio  
   - c. Preventing respiratory infections  
   - d. Improving nutrition 

8. If Charles were to eat two servings of this cottage cheese, how many grams of fat would he eat?
   - f. 6 grams  
   - g. 8 grams  
   - h. 10 grams  
   - j. 16 grams 

---

**Nutrition Facts**

Serving Size 1/2 Cup (124g)  
Servings Per Container about 4.2 

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>Calories</th>
<th>Calories from Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>115</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Daily Value**</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat 5g</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Saturated Fat 3g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol 25mg</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Sodium 380mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Carbohydrate 3g</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Dietary Fiber 0g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugars 4g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein 15g</td>
<td>30%</td>
<td></td>
</tr>
</tbody>
</table>

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1. Joseph wants to analyze a problem. In order to get started, he imagines a simplified representation of reality, or
   - A model
   - B table
   - C variable
   - D inquiry

2. Which of the following would most likely be found in a poorly designed experiment?
   - F variable
   - G control
   - H bias
   - J safety

3. Which of these features protects researchers from having a few atypical results that may skew the conclusion for an entire experiment?
   - A accuracy
   - B repetition
   - C background research
   - D precision

4. Which of the following could not be answered by scientific methods?
   - F How hot is hot chocolate?
   - G How long can I hold a bubble-gum bubble before it pops?
   - H How pretty is the Mona Lisa?
   - J How heavy is my science textbook?

5. An important element of an experiment is the hypothesis. A hypothesis helps an experimenter by
   - A providing a process for efficient communication of the experimental results
   - B allowing the researcher to rapidly draw conclusions following the experiment
   - C framing a question that the experiment can attempt to answer
   - D making available a safety program to protect the health of the experimenter

6. Even as science searches for answers to questions about the world, it helps society by providing
   - F solutions to moral issues
   - G political analysis
   - H technological advances
   - J absolute, unchangeable knowledge
7 Beth has been assigned a laboratory project. Which of these would be a poor scientific method for her to use to complete the project?

A referring to prior knowledge
B using technology
C keeping a lab notebook
D imposing personal values

Directions: Read Numbers 8 and 9 below. Then, on the lines that follow, write your answers in complete sentences.

8 Models are used by professions all over the world. Think of an example of a model that you use in everyday life. Describe the model and list the benefits of using that model.


9 Imagine an experiment that you would like to conduct. What are the steps you would take in order to plan the experiment?


DIRECTIONS
Choose the best answer choice for each of the following questions.

1. Which mineral property is being tested in the diagram above?
   a. cleavage
   b. hardness
   c. luster
   d. streak

2. What property is being shown in all of the minerals above?
   f. metallic luster
   g. fracture
   h. cleavage
   j. streak

3. Titanium has all of these properties EXCEPT ________.
   a. durability
   b. low density
   c. crystalline structure
   d. non-toxicity

4. When conditions permit, many minerals form crystals with elaborate geometric patterns. The crystalline structure of quartz shown in the diagram above is due to ________.
   f. the types of chemical elements contained within the crystal
   g. the internal arrangement of atoms within the crystal
   h. how long ago the crystal formed
   j. the shape of the surrounding rocks where the crystal formed
5. Jamaal placed a few drops of dilute hydrochloric acid (HCl) on an unknown mineral sample. The mineral sample fizzed, producing bubbles of a gas. Most likely, the mineral sample was _________.
   a. calcite
   b. feldspar
   c. quartz
   d. mica

6. Information about silicate would most likely be found under which heading in a table of contents?
   f. Moh’s Scale of Hardness
   g. A Sparkling Wonder: The Hope Diamond
   h. Minerals Formed by Silicon and Oxygen
   j. Minerals That Taste Good!

7. According to the chart, which of the following is the hardest mineral?
   a. quartz
   b. feldspar
   c. calcite
   d. diamond

Moh’s Scale of Hardness

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talc</td>
<td>1</td>
</tr>
<tr>
<td>Gypsum</td>
<td>2</td>
</tr>
<tr>
<td>Calcite</td>
<td>3</td>
</tr>
<tr>
<td>Fluorite</td>
<td>4</td>
</tr>
<tr>
<td>Apatite</td>
<td>5</td>
</tr>
<tr>
<td>Feldspar</td>
<td>6</td>
</tr>
<tr>
<td>Quartz</td>
<td>7</td>
</tr>
<tr>
<td>Topaz</td>
<td>8</td>
</tr>
<tr>
<td>Corundum</td>
<td>9</td>
</tr>
<tr>
<td>Diamond</td>
<td>10</td>
</tr>
</tbody>
</table>
**DIRECTIONS**

Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Cleavage/Fracture</th>
<th>Color</th>
<th>Streak</th>
<th>Luster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotite Mica</td>
<td>Cleavage thin</td>
<td>black to brown</td>
<td>Green</td>
<td>Glassy</td>
</tr>
<tr>
<td>Calcite</td>
<td>Cleavage rhombic</td>
<td>white to clear</td>
<td>White</td>
<td>Glassy</td>
</tr>
<tr>
<td>Fluorite</td>
<td>Cleavage 90°</td>
<td>purple to clear</td>
<td>White</td>
<td>Glassy</td>
</tr>
<tr>
<td>Galena</td>
<td>Cleavage 90°</td>
<td>silver to gray</td>
<td>Black</td>
<td>Metallic</td>
</tr>
</tbody>
</table>

1. Which of these could have a glassy luster, a white streak, a clear color, and cleavage at 90°?
   - A  biotite mica
   - B  calcite
   - C  fluorite
   - D  galena

2. In beach sand, quartz is the most abundant mineral because of its
   - F  hardness
   - G  streak
   - H  cleavage
   - J  luster

3. Most of the minerals found in rocks belong to a group that contains silicon, oxygen, and one or more metals. This group is called the
   - A  carbonates
   - B  ores
   - C  oxides
   - D  silicates

4. A mineral that contains a useful substance that can be mined for profit is called an ore. Which of the following may be classified as an ore?
   - F  calcite (CaCO₃)
   - G  halite (NaCl)
   - H  hematite (Fe₂O₃)
   - J  quartz (SiO₂)
5 A mineral is a naturally occurring, inorganic, crystalline solid with a definite chemical composition. Which of the following is not a mineral?

A calcite  
B coal  
C halite  
D talc

6 A student plotted the mass and volume of five different samples of the same mineral as shown on the graph above. She calculated the density using the formula $D = \frac{M}{V}$. The density she recorded was most likely measured in

F grams  
G cubic centimeters  
H pounds per square inch  
J grams per cubic centimeter

7 Which of these statements is true?

A Apatite can scratch fluorite.  
B Diamond can be scratched by corundum.  
C Calcite can scratch quartz.  
D Topaz can be scratched by quartz.

8 Which statement provides the best description of the mineral property called streak?

F Streak is the way a mineral reflects light from its surface.  
G Streak is the color of the powder left by a mineral when it is rubbed against a surface.  
H Streak is the ability of a mineral to resist being scratched.  
J Streak is the tendency of a mineral to easily break along smooth, definite surfaces.
1. The rocks in Group A are different from the rocks in Group B because only the rocks in Group A have _________.
   a. foliated layers
   b. the mineral quartz
   c. visible crystals
   d. plant and animal remains

2. According to the table, a sedimentary rock with a grain size of 0.1 cm would have the name _________.
   f. conglomerate
   g. sandstone
   h. siltstone
   j. shale

3. Slate belongs to a group of rocks that have mineral grains lined up in parallel layers. According to this definition, which of these is slate?
   a. 
   b. 
   c. 
   d. 

Detrital Sedimentary Rocks

<table>
<thead>
<tr>
<th>Rock Name</th>
<th>Grain Size</th>
<th>Composition</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conglomerate</td>
<td>larger than 0.2 cm</td>
<td>gravel, pebbles</td>
<td>rounded fragments</td>
</tr>
<tr>
<td>Sandstone</td>
<td>0.006 to 0.2 cm</td>
<td>sand</td>
<td>fine to coarse</td>
</tr>
<tr>
<td>Siltstone</td>
<td>0.004 to 0.006 cm</td>
<td>silt</td>
<td>very fine grain</td>
</tr>
<tr>
<td>Shale</td>
<td>smaller than 0.004 cm</td>
<td>clay</td>
<td>compact; splits easily</td>
</tr>
</tbody>
</table>
4. The diagram is a geologic cross-section of an area where a river has exposed a cliff of rock layers. According to the picture, which rock layer is the oldest?
   a. Q
   b. R
   c. S
   d. T

5. According to this chemical formula, all of the following elements are found in limestone EXCEPT ________.
   a. calcium
   b. carbon
   c. hydrogen
   d. oxygen

6. The size of crystals in igneous rock can be determined by how fast the magma cools and solidifies. The faster the magma cools, the smaller the crystals. Which sample of granite formed from magma that cooled and solidified at the slowest rate?
   f. 
   g. 
   h. 
   j. 

CaCO₃
Limestone
Which statement is best supported by the information shown in the diagram?

A. Igneous rocks form by the melting and solidification of magma.
B. Metamorphic rocks form by burial and cementing of sediments.
C. Sedimentary rocks form by heat and pressure applied to other rocks.
D. Igneous rocks form by weathering and erosion of other rocks.

Farina observed large crystals in a sample of granite. The large crystals in the sample were most likely formed by the

A. compaction and cementation of sediments
B. weathering and erosion of igneous rock
C. slow cooling and solidification of magma
D. application of heat and pressure from overlying rock layers
4. Silt and clay settle to the ocean bottom farther from the shore than rocks and pebbles because of their
   - F chemical composition
   - G spherical shape
   - H crystalline structure
   - J low density

5. Which statement accurately describes the process of metamorphism?
   - A Metamorphism is the changing of one type of rock into another as a result of heat and pressure.
   - B Metamorphism occurs only in active volcanoes.
   - C Erosion is the cause of all metamorphism.
   - D Metamorphism is the change that occurs in species over time.

6. Which of the following instruments would be used to measure the volume of a rock sample?

7. A geologist measured the density of a sample of basalt. The density recorded was most likely measured in
   - A grams
   - B grams per cubic centimeter
   - C pounds
   - D centimeters per pound
1. Earth’s atmosphere changed over time and eventually was able to support plant life. Which of these is the most likely cause of the change?
   a. Increased volcanic activity produced a lot of nitrogen and carbon dioxide gas.
   b. Gases from outer space entered Earth’s atmosphere.
   c. Sunlight caused oxygen gas to form in the atmosphere.
   d. The ozone layer formed, protecting plants from ultraviolet radiation.

2. In which one of Earth’s systems are these pictures taking place?
   f. mesosphere
   g. stratosphere
   h. hydrosphere
   j. thermosphere

3. What type of energy transfer occurs when the heat in the sand transfers to the person’s feet?
   a. convection
   b. conduction
   c. radiation
   d. kinetic

4. Which of these characteristics would be the most important in a sunscreen?
   f. the brand name
   g. the types of moisturizing ingredients for the skin
   h. the amount of protection from ultraviolet radiation
   j. the quality of the perfumes added
5. In the thermosphere, there is a layer called the ionosphere that can help radio waves travel. The ionosphere is made up of ________.
   a. electrically charged particles
   b. prevailing easterlies
   c. ultraviolet radiation from the sun
   d. carbon dioxide gas from cars

6. Which type of wind generally moves from the southwest to the northeast in the northern hemisphere?
   f. polar easterlies
   g. jet stream
   h. sea breeze
   j. prevailing westerlies

7. Which of the following is NOT a characteristic of the troposphere?
   a. Contains a high level of water vapor
   b. Contains a high level of atmospheric gases
   c. Contains a high level of ozone
   d. Extends from the surface of Earth up to about 10 kilometers

8. Which of the following causes cold air to move from the land to the water?
   f. sea breeze
   g. Coriolis effect
   h. land breeze
   j. trade winds

9. Which of these can be associated with the group above?
   a. ozone
   b. ultraviolet
   c. heat
   d. thermosphere
Plants and animals thrived on Earth after the ozone layer was formed. It protects the Earth from

A. solar radiation  
B. meteor showers  
C. acid rain  
D. volcanic gas

Seth’s teacher explained that the hydrosphere consists of all the water on Earth’s surface. Which of the following is a part of the hydrosphere?

F. snow  
G. wind  
H. sunlight  
J. soil

Jet streams enable pilots to reach their destinations faster. Which of these must be true in order for this to happen?

A. There can be no clouds or rain in the jet stream.  
B. The wind and plane have to be moving in the same direction.  
C. The plane has to be flying at altitudes lower than the clouds.  
D. The plane has to be flying in a windy season.

Some people need special products to prevent them from getting sunburned. These products can do this by

F. changing the skin into a darker color  
G. absorbing sunlight into the skin  
H. reflecting sunshine from the skin like a mirror  
J. preventing harmful UV rays from entering the skin
Heat can be transferred in several ways. This table describes three types of heat transfer. Which of the following is an example of conduction?

A sun shining on a metal chair  
B fire heating a room  
C a metal pan burning a hand  
D hair dryer blowing hair

Heat Transfer

<table>
<thead>
<tr>
<th>Type of Transfer</th>
<th>How It Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation</td>
<td>With rays or waves</td>
</tr>
<tr>
<td>Conduction</td>
<td>Contact of material</td>
</tr>
<tr>
<td>Convection</td>
<td>Flow of material</td>
</tr>
</tbody>
</table>

6 Car exhaust combines with the air to form brown haze. A decrease in the number of people driving would result in

F an increase in the amount of pollution  
G a decrease in the amount of clean air  
H an increase in the amount of traffic  
J a decrease in the amount of brown haze

7 The troposphere is the layer of the atmosphere closest to Earth’s surface. Which of these would you expect to find in the troposphere?

A a shooting star  
B extremely high temperatures  
C clouds and rain  
D the ionosphere

Directions: Read Number 8 below. Then, on the lines that follow, write your answer in complete sentences.

8 Some areas of Earth receive much more wind than other areas. Early traders used sailboats to travel across the ocean. Explain why it was necessary for them to learn which areas had wind and which areas didn’t.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. What is the correct sequence for the formation of a cold front?
   a. W, Y, X, Z
   b. Y, W, X, Z
   c. Y, Z, X, W
   d. Z, X, W, Y

2. Which of these facts best explains why warmer air causes an increase in humidity and cooler air causes a decrease in humidity?
   f. Sunlight evaporates moisture.
   g. Saturated air cannot hold any more moisture.
   h. Cool air causes water molecules to join and condense.
   j. The dew point changes with the amount of moisture in the air.

3. Which of the lines above correctly represents the relationship of temperature to atmospheric pressure?
   a. 1
   b. 2
   c. 3
   d. 4
4. The pictures show different types of clouds. Which of these shows cumulus clouds?
   f. A
   g. B
   h. C
   j. D

5. Severe weather can be very dangerous. What does it mean when the National Weather Service issues a tornado warning?
   a. There is a small chance of a tornado forming.
   b. A tornado is in a nearby area, but it is not severe enough to cause damage.
   c. A tornado might occur the next day.
   d. A tornado has been sighted and immediate action should be taken.

6. According to the chart, which month had the LEAST precipitation?
   f. March
   g. May
   h. June
   j. August

Precipitation Amounts

<table>
<thead>
<tr>
<th>Month</th>
<th>Precipitation (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>10.63</td>
</tr>
<tr>
<td>April</td>
<td>11.47</td>
</tr>
<tr>
<td>May</td>
<td>14.68</td>
</tr>
<tr>
<td>June</td>
<td>9.32</td>
</tr>
<tr>
<td>July</td>
<td>5.87</td>
</tr>
<tr>
<td>August</td>
<td>4.99</td>
</tr>
</tbody>
</table>
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. Which of these statements is correct?
   A. Thunder is electricity.
   B. Thunder comes before lightning.
   C. Lightning causes thunder.
   D. Air molecules change into lightning.

2. With which of these would you expect to find very high winds?
   F. rain
   G. hurricane
   H. snow
   J. flood

3. Humidity is the amount of moisture in the air. What would cause the humidity to decrease?
   A. thunderstorms
   B. snow
   C. rain
   D. drought

4. The picture above shows a device that helps determine the
   F. amount of rain
   G. wind speed
   H. direction of wind
   J. weather

GO ON
5 Which sentence below might explain how lightning occurs?
   A Oppositely charged air molecules attract and make light from electricity.
   B High winds make air move so fast that it turns into light.
   C Light from the sun reflects from the rain in quick bursts down to Earth's surface.
   D Lightning comes from any type of storm.

6 Meteorologists use satellites to
   F predict the weather
   G diminish tornadoes
   H change the weather
   J determine vacation plans

7 Which of the following is not an example of severe weather?
   A blizzard
   B rain
   C flood
   D hurricane

8 A meteorologist has located a storm on radar. She would most likely use technology to determine
   F where the storm is headed
   G where the storm started
   H when the storm started
   J what areas have no storms

Directions: Read Number 9 below. Then, on the lines that follow, write your answer in complete sentences.

9 Design an experiment to collect data about how rain affects air temperature.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
1. Walruses live in polar climates. If the temperature of the climate changed and became warmer, which adaptation would NOT be appropriate for the new climate?
   a. tusks
   b. fins
   c. extra fat
   d. smooth skin

2. During El Niño, wind and precipitation patterns are affected around the world. Which of the following changes can occur as a result?
   f. floods in Australia and Africa
   g. storms in California
   h. droughts in the southern United States
   j. decrease in ocean temperatures

3. The most likely cause of an increase in Earth’s temperature is _________.
   a. an increase in the amount of greenhouse gases
   b. an increase in the amount of energy from the sun
   c. a decrease in the atmospheric gases
   d. a hole in the ozone layer

4. Which area in the picture would contribute most to a temperature increase in the city?
   f. grassy area
   g. building
   h. light posts
   j. parking lot
5. Information about global warming would most likely be found under which heading in a table of contents?
   a. Solar Energy
   b. Seasonal Temperature Changes
   c. Greenhouse Effect
   d. Wind Patterns

6. In general, the behavioral adaptation that provides animals the most benefit in the winter is ________.
   f. thick fur
   g. sharp teeth
   h. sweating
   j. hibernation

7. Which of these would form on the side of the mountain not facing the wind?
   a. lake
   b. glacier
   c. forest
   d. desert

8. Which of the following human activities would most affect the cycle shown above?
   f. burning fossil fuels
   g. deforestation
   h. pollution
   j. farming
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. Over time, animals adapt to their environments. Which animal has adapted to life in the hot tropical zone?
   A. snake
   B. moose
   C. penguin
   D. snowy owl

2. Jerry’s teacher gave him a rain gauge. He was able to use it to find out
   F. how many clouds were in the area
   G. how much rain had fallen
   H. the average temperature
   J. the level of rain pollution

3. We can help reduce the amount of energy used by changing simple things in our lives. Which of these would help save energy?
   A. watch less television
   B. keep lights on at night
   C. drive instead of walk
   D. drink more water

4. Which statement about trees is true?
   F. They release carbon dioxide into the atmosphere.
   G. They use sunlight to clean the air.
   H. They do not play a role in the carbon dioxide cycle.
   J. They help reduce the amount of carbon dioxide in the air.

5. Areas closer to the equator receive the most direct sunlight. Therefore, areas far from the equator probably
   A. receive a lot of rain
   B. often have storms and tornadoes
   C. are not as warm
   D. are more sunny
Scientists have found rock layers that show there was once ice covering the land. Which of the following can scientists learn from this process?

F how many animals lived  
G if there were people around  
H the climate of the area at that time  
J what the climate will be in the future

Some animals must undergo a time of greatly reduced activity in the winter in order to survive. They might do this because

A it makes them grow bigger  
B they have nothing to do  
C they are tired  
D there is not enough food

The picture shows how a greenhouse traps energy from the Sun. If Earth’s atmosphere acted similarly, what would happen to our climate?

F many more plants would grow  
G an ice age would occur  
H it might get warmer  
J nothing would change

Directions: Read Number 9 below. Then, on the lines that follow, write your answer in complete sentences.

Trees are important because they remove carbon dioxide from the air and release oxygen. They are also home to many types of living things. Humans have cut down many forests. What positive and negative effects could this have?

__________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________
1. Based on the information in the diagram, which of the following shows how the Moon will appear on March 19?

   a. ![Moon Icon]
   b. ![Moon Icon]
   c. ![Moon Icon]
   d. ![Moon Icon]

2. Which of these causes seasonal changes on Earth?

   f. The changing distance between Earth and the Sun
   g. The tilt of Earth on its axis
   h. The location of Earth in the solar system
   j. The changing speed of Earth in its orbit around the Sun

3. These data were collected by observing the time the Moon rose over a four-day period. If everything remains the same, at about what time will the Moon rise on Friday?

   a. 8:30 P.M.
   b. 9:10 P.M.
   c. 9:50 P.M.
   d. 10:20 P.M.

4. These pictures show the waxing phases of the Moon. Which of these orders the waxing phases of the Moon from first to last?

   f. S, T, Q, R
   g. S, Q, T, R
   h. R, T, Q, S
   j. Q, S, T, R
5. Which of these causes the change from day to night on Earth?
   a. The changing distance between Earth and the Sun
   b. The fact that Earth is tilted on its axis
   c. The rotation of Earth on its axis
   d. The changing speed of Earth in its orbit around the Sun

6. The diameter of Earth is 12,756 km. The diameter of Earth’s Moon is 3,476 km. Which pair of circles best represents the relative sizes of Earth and its Moon?
   f. Earth Moon
   g. Earth Moon
   h. Earth Moon
   j. Earth Moon

7. Astronomers have done chemical analysis of the atmosphere surrounding the planet Jupiter. They found that it is about 92% hydrogen, 7% helium, 0.5% methane, and 0.5% ammonia. Which area of the graph represents helium?
   a. Q
   b. R
   c. S
   d. T
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1 Which of the following best describes the shape of Earth?
   A perfectly spherical
   B spherical, with a slight bulge at the poles
   C spherical, with a slight bulge at the equator
   D cubic

2 Which of these statements is an accurate description of a lunar eclipse?
   F Earth rotates around its axis at exactly the same rate that it revolves around the Moon, momentarily blocking out a view of the Moon.
   G The Moon rotates around its axis at exactly the same rate that it revolves around Earth, momentarily blocking out a view of the Sun.
   H The Moon passes between Earth and the Sun, momentarily blocking out a view of the Sun.
   J Earth passes between the Sun and the Moon, momentarily making the Moon appear deep red.

3 Which of the following could be described as a gaseous giant planet?
   A Mars
   B Earth
   C Jupiter
   D Venus

4 Which of the following hypothetical reasons may have caused nebulae to condense and form our solar system?
   F Shock waves from a nearby comet
   G Shock waves from a nearby supernova
   H Vaporization from the Sun
   J Vaporization from a nearby comet’s tail

5 An amateur astronomer measured the distance to a new asteroid, located near Pluto. The distance the amateur astronomer recorded was most likely measured in
   A astronomical units
   B kilometers
   C centimeters
   D inches
As a meteorite falls to Earth, Earth’s atmosphere

F cools down the meteorite, solidifying it
G heats up the meteorite, burning it
H compresses the meteorite, making it heavier
J expands the meteorite, lengthening it

Which of the following describes a characteristic shared by both Uranus and Neptune?

A A total of eighteen moons
B The fastest winds of any planet
C a distinctive red color from gaseous nitrogen
D a distinctive blue color from atmospheric methane

Directions: Read Numbers 8 and 9 below. Then, on the lines that follow, write your answers in complete sentences.

8 Use what you know about the revolution of the Moon around Earth to explain the Moon’s phases. Draw a diagram as part of your explanation.

9 Describe the similarities and differences between the inner and outer planets.
1. Which of these statements about cells is true?
   f. All cells respond to light.
   g. They do not make up most living things.
   h. They take in materials from their surroundings.
   j. They do not contain any hereditary material.

2. Even though the weather is cold, the squirrel maintains a constant body temperature. What is this trait called?
   a. stimuli
   b. biogenesis
   c. homeostasis
   d. hypothesis

3. Organisms need all of the following things EXCEPT ________.
   f. energy
   g. water
   h. a place to live
   j. hunting skills

4. Scientists study many things about an organism to learn how to classify it. Which of these is used to determine how to classify an organism?
   f. How does the organism develop?
   g. How much food does it eat each day?
   h. What type of habitat does it live in?
   j. How many organisms of that type are alive today?

5. The scientific name for a wolf is Canis lupis. What does the second word in the name represent?
   a. genus
   b. kingdom
   c. specific epithet
   d. domain name

6. Which two-part organelle is most responsible for making the cell’s proteins?
   a. mitochondrion
   b. ribosome
   c. recycling organelle
   d. chloroplast
7. The picture above shows four petri dishes that receive different amounts of light every day. The clock face indicates the amount of light each petri dish receives. The petri dishes are filled with euglenoids, single-celled organisms that use chloroplasts to survive. Which plate can probably sustain the largest number of euglenoids?
   f. W
   g. X
   h. Y
   j. Z

8. Which structure supplies energy through aerobic respiration?
   a. nucleus
   b. ribosome
   c. endoplasmic reticulum
   d. mitochondrion

9. The rectangle in the picture above represents a cell. What are the triangles?
   a. nucleoli
   b. active viruses
   c. cytoskeletons
   d. latent viruses

10. A chemical that harms only prokaryotic cells would affect which of the following?
    f. fungi
    g. plants
    h. animals
    j. bacteria
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. Which of these statements is correct?
   A. Rocks grow and develop from energy.
   B. Energy uses living things.
   C. Trees respond to the wind.
   D. Young animals grow into mature animals.

2. Which of these birds most likely would be classified in the same group?
   F. 1 and 3
   G. 2 and 4
   H. 1 and 2
   J. 3 and 4

3. Plant A is growing well, but plant B is not growing as well. Which of these would probably help plant B?
   A. adding more water
   B. putting it in a much smaller pot
   C. opening the window shade
   D. changing the soil

4. Which of these pictures is an example of a mitochondrion?
5 Chlorophyll is contained in a plant’s
   A viruses
   B roots
   C chloroplasts
   D mitochondria

6 The liver, which is made of a variety of
different cell types, helps digest food.
The liver is a type of
   F organelle
   G species
   H cell theory
   J organ

Directions: Read Numbers 7–8 below. Then, on the lines that follow, write your answers in complete sentences.

7 The pictures show various living things. Describe what all living things need in order to survive.

8 Because viruses can multiply, some people consider them to be living organisms. Discuss the life cycle of a virus and how it is different from that of a cell.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. In a particular chemical reaction, substance A is converted into substance B. The amounts of the substances are measured in moles, a standard used by chemists. Which of the following is probably the hypothesis for this experiment?
   a. Substance X catalyzes the conversion of A to B.
   b. Substance B can convert into substance X.
   c. An increase in temperature decelerates most chemical reactions.
   d. Large amounts of substance A cannot be affected by substance X.

2. Which of the following could best describe what the nitrogen in the above illustration has become?
   f. compound
   g. ion
   h. organic
   j. mixture

3. A cell biologist is studying how cells use a particular substance. If energy is used to move this substance across a cell membrane, then ________.
   a. the cells may be using passive transport
   b. facilitated diffusion may be involved
   c. the cells must be using active transport
   d. the cells must rely on diffusion

4. Each of the following is an example of fermentation EXCEPT ________.
   f. a working muscle cell toward the end of a marathon run
   g. a brain cell used while reading a magazine
   h. a sulfur-respiring bacterial cell
   j. an organism used to turn milk into cheese
5. The experiment pictured above shows how the two substances in the beaker retain their properties even under different conditions. According to this information, the contents of the beaker must be ________.  
   a. a mixture  
   b. a salt  
   c. an inorganic compound  
   d. ions

6. Where in the cell does respiration occur?  
   f. endoplasmic reticulum  
   g. nucleus  
   h. Golgi body  
   j. mitochondria

7. The chemical processes that go on in the human stomach, liver, and lungs help keep humans alive. All of those processes are part of ________.  
   a. inorganic compounds  
   b. the digestive system  
   c. diffusion  
   d. metabolism

8. The triangles and circles represent different substrates in and near the cell. The best explanation for the presence of the triangles inside the cell is ________.  
   f. diffusion  
   g. passive transport  
   h. facilitated diffusion  
   j. active transport

9. Plants utilize chlorophyll containing chloroplasts and mitochondria. What is the purpose of mitochondria when a cell already has chloroplasts?  
   a. to store vitamins  
   b. to turn sugars into energy  
   c. to help plants store water  
   d. to fight off infection and disease
Which of the choices below is a compound?
A oxygen
B hydrogen
C salt
D carbon

Which statement best explains osmosis?
F Osmosis is the movement of water.
G Osmosis is the diffusion of water.
H Osmosis is the diffusion of water through a mixture.
J Osmosis is the diffusion of water through a membrane.

Which shape is passively transported across the middle membrane in the diagram above?
A circles
B ovals
C squares
D rectangles

Which of the following is not involved in bringing materials into cells?
F endocytosis
G osmosis
H active transport
J exocytosis

Which of these statements is true?
A Photosynthesis is part of fermentation.
B Metabolism is part of photosynthesis.
C Metabolism is part of respiration.
D Fermentation is part of metabolism.
6. White blood cells in your body defend you against infection by engulfing invading organisms. The white blood cell engulfs the invader into itself by the process of:

- **F** endocytosis
- **G** diffusion
- **H** exocytosis
- **J** photosynthesis

7. A biologist is studying a single-celled organism found in a pond. The biologist finds out that the organism does not require oxygen to survive and concludes that the organism:

- **A** does not use photosynthesis
- **B** does not respire
- **C** does not ferment
- **D** does not endocytose

**Directions:** Read Numbers 8–9 below. Then, on the lines that follow, write your answers in complete sentences.

8. Different animals use different adaptations to help them survive and reproduce. Despite this wide range of variations, their metabolisms are very similar. Discuss the metabolic similarities between animals that seem very different.

9. A student who is accustomed to running one or two miles runs five miles one particular afternoon and complains of pain in his leg muscles. The student’s coach explains that the pain is caused by lactic acid. How did lactic acid get into the student’s leg muscles and why did it only happen on the one afternoon?
1. Lila wanted to observe the process of mitosis. She could see this in all of the following cell types EXCEPT ________.
   a. skin  
   b. adult nerve  
   c. onion skin  
   d. cheek

2. Which of the following lists the stages of mitosis in the correct order?
   f. metaphase, anaphase, prophase, telophase  
   g. anaphase, telophase, prophase, metaphase  
   h. telophase, anaphase, metaphase, prophase  
   j. prophase, metaphase, anaphase, telophase

3. Which statement best describes what happens during meiosis I?
   a. Four diploid sex cells are formed.  
   b. Four haploid sex cells are formed.  
   c. Two diploid cells are formed.  
   d. Two haploid cells are formed.

4. Mutations are mistakes that sometimes happen when DNA is being copied. Mutations might affect the health of a species by ________.
   f. limiting the genetic variety of a species  
   g. limiting the species’ ability to grow, repair, or maintain itself  
   h. increasing the efficiency of protein production  
   j. increasing the number of steps that occur during mitosis

5. In 1953, scientists Watson and Crick made an accurate model of a DNA molecule. Which of the following represents this shape?
   a.  
   b.  
   c.  
   d.  

GO ON
6. According to the pictures, asexual reproduction results in new bacteria whose genetic material is ________.
   f. identical to that of the parent
   g. not identical to that of the parent
   h. half-identical to both parents
   j. identical to another parent

7. During mitosis, DNA is copied and passed on to new cells. In which part of the cell is this hereditary material located?
   a. cell membrane
   b. chromosomes
   c. nucleus
   d. cell wall

8. All of the following are types of asexual reproduction EXCEPT ________.
   f. budding
   g. fertilization
   h. regeneration
   j. fission

9. Which of the following lists the stages of protein production in the correct order?
   a. mRNA → DNA → rRNA → tRNA
   b. RNA → mRNA → DNA → tRNA
   c. mRNA → DNA → tRNA → rRNA
   d. DNA → mRNA → rRNA → tRNA

10. Information about haploid cells would most likely be found under which heading in a table of contents?
    f. Asexual Reproduction
    g. Zygotes
    h. Sexual Reproduction
    j. Protein Building
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. Which of the following does not result in offspring that are identical to the parent?
   A. budding
   B. asexual reproduction
   C. sexual reproduction
   D. fission

2. Which of these statements is true?
   F. Genes code for proteins.
   G. Proteins code for genes.
   H. Genes code for DNA.
   J. Proteins code for DNA.

3. Which of the following pieces of equipment would be best to use for observing mitosis in onion skin?
   A. 
   B. 
   C. 
   D. 

DNA \rightarrow \text{GENE} \rightarrow \text{PROTEIN}
Toshiko wants to determine what type of reproduction a particular organism undergoes. She finds out that all of the organism’s offspring look identical to the original organism. She determines that this organism reproduces

F asexually
G frequently
H sexually
J rarely

Skin cells in your body divide by the process of

A meiosis
B budding
C heredity
D mitosis

Directions: Read Number 6 below. Then, on the lines that follow, write your answer in complete sentences.

There are hundreds of different types of dogs in the world. Dogs are a type of animal that reproduce sexually. What would happen if dogs began to reproduce asexually? Explain the differences between asexual and sexual reproduction in your answer.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. A scientist is investigating genetic mutations by growing bacteria in two dishes. One dish receives several minutes of X rays every day, and the other receives several hours of sunlight everyday. If the experiment is designed to find out if X rays or sunlight cause genetic mutations, the scientist should ________.
   a. use additional dishes to create mutations with chemicals
   b. record the amount of X rays and sunlight that reach the dishes
   c. record the weight of each dish
   d. use a third dish that doesn’t receive X rays or sunlight

2. Diego wants to grow apple trees. He knows that if a particular tree produces many apples every year, its offspring probably also will produce many apples. He has recorded the number of apples harvested from 10 trees every year for several years. According to his data, which tree is most likely to produce fewer than 12 apples in any given year?
   f. Tree 7
   g. Tree 8
   h. Tree 9
   j. Tree 10

3. The chart above was made to record data from an experiment investigating inherited traits in fruit flies. This experiment probably tests which of the following hypotheses?
   a. Females with white eyes lay eggs sooner than females with red eyes.
   b. Eye color is controlled by a sex-linked gene.
   c. Females with red eyes do not lay eggs.
   d. White-eyed females only breed with white-eyed males.

4. All of these can be used to describe types of inheritance patterns EXCEPT ________.
   f. polygenic inheritance
   g. incomplete dominance
   h. sex linkage
   j. recombinant DNA
5. The pedigree above shows how geneticists depict the inheritance of a trait through a family. Which of the following shows the most likely inheritance of a sex-linked recessive trait?

- a.
- b.
- c.
- d.

6. Drawings from hundreds of years ago depict horses that are much smaller than horses are today. Which of the following is the best explanation for the increased size of horses?

- f. Horses have been genetically engineered.
- g. Selective breeding has removed shorter horses from the gene pool.
- h. Genetic therapies have been used to make horses larger.
- j. Certain sex-linked genes have been lost.
The process of an organism passing on its traits to its offspring is called

A a Punnett square
B a pedigree
C heredity
D phenotype

Robert crossbreeds two plants, one with red flowers and one with white flowers. Weeks later the offspring plants produce red flowers. Robert determines that

F the red flower allele is dominant
G the white flower allele is dominant
H the red flower is incompletely dominant
J the white flower is incompletely dominant

Maria Rosa crossbreeds two plants, one with dark blue flowers and one with white flowers. Weeks later she discovers that the offspring plants have light blue flowers. Maria Rosa determines that the

A dark blue flower allele is dominant
B light blue flower allele is dominant
C dark blue flower allele is incompletely dominant
D light blue flower allele is completely recessive

Which of the following organisms does not have sex-linked genes?

F yeast
G ducks
H fish
J dolphins

What can you conclude about the trait followed in the pedigree above?

A It is incompletely dominant in every other generation.
B It is coded for a sex-linked gene.
C It only affects females.
D The trait shows polygenic inheritance.
By analyzing a blood sample, a doctor can tell a patient whether his or her children might inherit a genetic condition. This is true even if the patient doesn’t have that condition. This type of analysis tells the doctor about a patient’s **F phenotype**

**G recombinant DNA**

**H pedigree**

**J genotype**

In the Punnett square, the R and the r represent

- **A alleles**
- **B hybrids**
- **C environmental factors**
- **D dominance**

Directions: Read Numbers 8–9 below. Then, on the lines that follow, write your answers in complete sentences.

8 For hundreds of years, doctors have used medications to treat illnesses, including those caused by genetic defects. Scientists, however, are now developing gene therapy for such illnesses. How is gene therapy different from traditional medications?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

9 A gardener crossbreeds his red rose bush with his white rose bush and gets new rose bushes with ten different shades of red, white, and pink. Explain how this happened.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
1. The diagram above depicts the site where these data were collected by paleontologists. To improve their study, they also could record ________.
   a. the time of year
   b. information about layer N
   c. the address of the work site
   d. the weight of the sedimentary rocks

2. Which of the following is the best way to determine whether snakes evolved from fish?
   f. Analyze their tissues with radioactive dating.
   g. Apply Lamarck’s theory of acquired characteristics.
   h. Compare their skeletons.
   j. Compare each organism’s DNA.

3. The chart is being filled in as data from an experiment become available. Which of the following is the most likely hypothesis for this experiment?
   a. The three organisms share a common ancestor.
   b. Most embryos acquire their parent’s characteristics.
   c. Each of these organisms requires six weeks to have offspring.
   d. Gill slits are not essential to live.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Composition</th>
<th>Estimated Age (years)</th>
<th>Depth (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Sedimentary rock</td>
<td>100,000</td>
<td>0–4</td>
</tr>
<tr>
<td>N</td>
<td>Sedimentary rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Sedimentary rock</td>
<td>6 million</td>
<td>8–9</td>
</tr>
<tr>
<td>P</td>
<td>Sedimentary rock</td>
<td>6.1 million</td>
<td>9–10</td>
</tr>
</tbody>
</table>

   | 1 | gill slits | gill slits |
   | 2 | 4 limbs   | 4 legs and a tail |
   | 3 | 4 limbs   | 2 limbs and 2 wings|

4. A paleontologist discovers a layer of sedimentary rock filled with fossils of known and unknown species. She collects some of the fossils of the unknown species for further analysis. Which of the following would improve her analysis?
   f. dating the unknown fossils with those from known species
   g. digging deeper to the next sedimentary layer
   h. studying the region’s geographic isolation
   j. collecting all of the unknown fossils
5. The skeleton above is of the leg of a horse. Which of the following is the most homologous to the skeletal structure of a horse’s leg?

a. 

b. 

c. 

d. 

6. The table above is probably used to answer which of the following questions?

f. What homologous structures do the organisms have?

h. Do the organisms possess any shared vestigial structures?

j. How closely related are these four organisms?

7. During a storm, several butterfly-eating birds were blown to a distant island. The island, which previously had no birds, was filled with butterflies of all colors. One year later, all the butterflies are dark green and brown. Which of the following is the most likely explanation for the change in the butterfly population?

a. Gradualism is selecting against red, yellow, and blue butterflies.

b. Natural selection favored the dark green and brown butterflies.

c. Primates likes to eat all the other butterflies.

d. A genetic mutation led to punctuated equilibrium.
The testing of nuclear weapons has added a small but detectable amount of radiation to Earth’s atmosphere. How might this interfere with radiometric dating?

A. It causes the radioactive elements to stop releasing steady amounts of radiation.
B. It adds radioactive elements to rocks.
C. It removes some of the original radioactive elements from the rock.
D. It interferes with scientists’ tools so that they cannot measure radiation accurately.

Which of the following is a primate?

F. gorilla
G. marsupial
H. shark
J. cat

Which of the following results in an offspring that has traits that are not inherited from the offspring’s parents?

A. mutation
B. competition
C. natural selection
D. isolation

Which statement best explains how natural selection occurs?

F. Natural selection occurs when adaptations help an organism reproduce and survive.
G. Natural selection occurs when organisms are geographically isolated.
H. Natural selection occurs when an organism’s offspring grow vestigial structures.
J. Natural selection occurs when characteristics from the parent organisms are inherited.

Which organism in this evolutionary tree is an ancestor?

A. fungi
B. green plants
C. eukaryotes
D. animals

Adaptations over Time
The rapid evolution of a new species can occur by the process of

F  gradualism
G  punctuated equilibrium
H  adaptation
J  survival

Evolutionary biologists study embryos of different organisms in order to

A  learn which organisms are related to each other
B  understand the different adaptations used by a species
C  learn what structural parts are vestigial
D  determine the age of an organism

**Directions:** Read Numbers 8–9 below. Then, on the lines that follow, write your answers in complete sentences.

8  Determining the age of rocks found near fossils is an important step in understanding evolution. Discuss how relative and radiometric dating are used to determine the age of a fossil.

9  Natural selection favors organisms with helpful adaptations. Discuss how one well-adapted organism can give rise to a new species.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. The truck at Point A is going to make a food delivery to the supermarket at Point B. What does the truck best represent?
   a. a nerve sending a signal
   b. blood carrying nutrients to a cell
   c. digestion from the esophagus to the large intestine
   d. a white blood cell fighting an infection

2. A process by which materials pass into and out of cells in the body is called _______.
   f. cytoplasmosis
   g. transpiration
   h. diffusion
   j. evaporation

3. Which letters represent the ventricles in the drawing above?
   a. A and B
   b. A and C
   c. D and B
   d. C and D

4. Which process is taking place in the picture above?
   f. spleen cleaning the blood
   g. white blood cells fighting bacteria
   h. blood clotting
   j. oxygen attaching to hemoglobin
5. All of these help your body to defend itself against pathogens and might prevent disease EXCEPT ________.
   a. skin
   b. cilia
   c. enzymes
   d. red blood cells

6. What is the purpose of a vaccination for a specific disease?
   f. to cure the disease once you have it
   g. to prevent the disease from developing
   h. to decrease number of helper T cells in the blood
   j. to decrease antibody formation

7. What is the purpose of using chemotherapy to treat cancer?
   f. to stimulate T-cell production
   g. to stimulate hormone development
   h. to destroy cancer cells
   j. to prevent new cancer cells from growing

8. All of these systems of the body are part of your immune system EXCEPT ________.

   f. Skeletal System
   g. Circulatory System
   h. Digestive System
   j. Respiratory System
Circulation and Immunity

DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. People infected with HIV do not fight off infections well. Which of these is the most likely cause of this?
   A. They have too much hemoglobin.
   B. Their red blood cells are iron deficient.
   C. Their white blood cells have a distorted shape.
   D. They don’t have many helper T cells.

2. Which of the following would be the next stage in the above chart?
   F. Oxygen-poor blood enters the veins
   G. Oxygen-rich blood enters the aorta
   H. Oxygen-poor blood enters the aorta
   J. Oxygen-rich blood enters the vena cava

3. Two arteries and two veins are labeled in the diagram above. Which two are veins?
   A. A and B
   B. B and C
   C. B and D
   D. C and D

4. The liquid portion of blood is called
   F. plasma
   G. hemoglobin
   H. platelets
   J. fibrin

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Cecilia had been sick with a cold for two days. On the third day, her body temperature rose and she developed a fever. What caused her to develop a fever?

- A the cold virus
- B her body’s immune system
- C killer T cells giving off heat energy to fight foreign matter
- D allergens creating heat while multiplying

What are the proteins that your body produces in response to foreign matter?

- F antigens
- G allergens
- H antibodies
- J helper T cells

What is the name for the process of heating a liquid to a temperature that kills bacteria?

- A fermentation
- B pasteurization
- C immunization
- D vaccination

**DIRECTIONS**
Read Number 8 below. Then, on the lines that follow, write your answer in complete sentences.

**8** Compare and contrast the functions of red blood cells, white blood cells, and platelets.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. According to the food pyramid, which food group should we eat the largest quantities of during a day?
   a. fats, oils, and sweets
   b. milk, yogurt, and cheese
   c. vegetables and fruits
   d. bread, cereal, and rice

2. What is the primary function of the villi in the small intestine?
   f. to help blood flow into the veins
   g. to increase nutrient absorption
   h. to decrease water absorption
   j. to help produce vitamin A

3. Which organ of the digestive tract is missing?
   a. spleen
   b. gall bladder
   c. teeth
   d. rectum

4. The breakdown of carbohydrates into carbon, hydrogen, and oxygen during digestion is sped up by proteins called _________.
   f. lipids
   g. enzymes
   h. peristalsis
   j. vitamins

5. What is the primary function of nephrons in the kidney?
   a. to remove wastes from blood
   b. to remove water from cells
   c. to add carbon dioxide into cells
   d. to add salt into the blood
6. A student is working on a science experiment. The student has a plastic bottle almost completely filled with colored water. The bottle is sealed by a cork with two tubes in it. One glass tube is long enough to be in the water, and it connects to a rubber tube that travels from the bottle to a graduated cylinder. The other glass tube does not touch the water, and it connects to a rubber tube into which the student can breathe. The student blows into the rubber tube. What is probably being measured in the student’s experiment?

f. pH of exhaled air
g. volume of exhaled air
h. carbon dioxide level of exhaled air
j. how much dye has been added to color the water

7. Which balloon best shows how your lungs move when you inhale?

a. 

b. 

c. 

d. 

8. Which of the following wastes is eliminated by both the respiratory and excretory systems?

f. carbon dioxide
g. water
h. urea
j. salt

9. A person takes a breath, inhaling deeply. If all other factors are equal, the pressure inside the person’s lungs while beginning to inhale is 

a. the same as the pressure after she inhaled
b. greater than the pressure outside the person
c. less than the pressure outside the person
d. the same as the pressure outside the person
One day in class, Esther ate some crackers. She noted that they became soft while in her mouth. Which statement explains why this happened?

A. Digestion begins in the mouth.
B. Taste buds help break down food.
C. Teeth do not help with digestion.
D. Digestion begins in the throat.

What could be used as the missing heading?

F. Part of Nervous System?
G. Part of Digestive System?
H. Part of Skeletal System?
J. Part of Circulatory System?

As food passes through your digestive tract, its breakdown into smaller molecules is aided by

A. chemicals called enzymes
B. carbohydrates and proteins
C. chemicals called neurotransmitters
D. the villi in the small intestine

Which of the following is manufactured by your skin when it is exposed to sunlight?

F. Vitamin C
G. Vitamin B
H. Vitamin D
J. Vitamin K

Tiny, hair-like structures in your nasal cavity help to filter out dust and other materials. These hairs are called

A. alveoli
B. epiglottis
C. cilia
D. bronchioles
Two mountain climbers notice that as they climb and the temperature drops, they are able to see their breath when they exhale. The reason that they are able to see their breath is because it contains:

- F oxygen vapor
- G water vapor
- H nitrogen vapor
- J carbon dioxide

Physicians are able to filter the blood of patients with poorly functioning kidneys by using special machines. This process is called:

- A analysis
- B CT scan
- C dialysis
- D filtration

Directions: Read Numbers 8 and 9 below. Then, on the lines that follow, write your answer in complete sentences.

8. Digestion is both chemical and mechanical. Compare and contrast these two processes of digestion.

9. The terms breathing and respiration are often confused. Explain the differences between breathing and respiration and how the two are related.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. Kaylie wanted to find out which type of sunscreen best protected her skin from UV radiation. She put one type of sunscreen on her right arm and another type of sunscreen on her left arm. Then she sat near a window with her right arm in the sunlight and her left arm in the shadow. Her experiment could be improved by ________.
   a. placing her left arm near a bright lamp
   b. sitting near the window during the sunniest hours of the day
   c. putting more types of sunscreen on her arms
   d. placing both arms in an equal amount of sunlight

2. The picture shows a cross section of human skin. Which section is the dermis?
   f. Q
g. R
h. S
j. T

3. All of these muscles are examples of smooth muscle EXCEPT ________.
a. large intestines
b. blood vessels
c. bladder
d. bicep
4. The bones in Group A are different from the bones in Group B because only the bones in Group A have ________.
   
   f. immovable joints  
   g. calcium  
   h. movable joints  
   j. pivot joints

5. All of your body’s senses work together to maintain ________.
   
   a. balance  
   b. body weight  
   c. homeostasis  
   d. taste

6. Degeneration of neurons in the cerebellum would most likely result in some loss of ________.
   
   f. short-term memory  
   g. muscle coordination and balance  
   h. sensation in the extremities  
   j. the ability to read

7. The above picture shows two neurons. A nerve impulse moves from Neuron A to Neuron B because of ________.
   
   a. the release of various carbohydrates into the synapse  
   b. the release of chemicals called neurotransmitters  
   c. the dendrites that are connected  
   d. Neuron A hitting against Neuron B

8. The table shows the speed at which nerve impulses travel in axons (nerve fibers) of different diameters. A reasonable hypothesis based on these data is that as the diameter of an axon increases, ________.
   
   f. the sensitivity of the nerve decreases  
   g. the sensitivity of the nerve increases  
   h. the speed of nerve transmission decreases  
   j. the speed of nerve transmission increases

<table>
<thead>
<tr>
<th>Axon Type</th>
<th>Diameter (µm)</th>
<th>Speed (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>13–20</td>
<td>80–120</td>
</tr>
<tr>
<td>B</td>
<td>6–12</td>
<td>35–75</td>
</tr>
<tr>
<td>C</td>
<td>1–5</td>
<td>5–35</td>
</tr>
<tr>
<td>D</td>
<td>0.2–1.5</td>
<td>0.5–2.0</td>
</tr>
</tbody>
</table>
1. Which bones are most responsible for a person's height?

A. thigh bone and backbone
B. arm bone and knee
C. rib cage
D. pelvic bone

2. White blood cells are produced in the part of a bone called the

F. compact bone
G. spongy area
H. red marrow
J. cartilage

3. When your skin is exposed to ultraviolet rays, melanin production increases. How does this affect your skin?

A. It becomes lighter.
B. It becomes darker.
C. It has no effect at all.
D. It prevents skin cancer.

4. Which of the following words best describes skeletal muscle?

F. involuntary
G. mostly involuntary
H. voluntary
J. mostly voluntary
Directions: Read Number 8 below. Then, on the lines that follow, write your answer in complete sentences.

8 The picture illustrates the three layers of skin. Explain the differences between the three layers of skin.

5 How does shivering best help the human body?
A It exercises our muscles.
B It helps us keep cold.
C It exercises our bones.
D It helps us keep warm.

6 Lawrence’s teacher is describing a certain part of the eye. He says it is a tissue at the back of the eye that is sensitive to light. The tissue contains two types of cells called rods and cones. Lawrence correctly identifies the part as the
F pupil
G retina
H optic nerve
J lens

7 Which of the following statements is accurate?
A Reflexes are voluntary actions.
B Reflexes are caused by muscle contractions.
C Reflexes are involuntary actions.
D Reflexes are not reactions to stimuli.
1. Which of these shows the correct path of hormones?
   a. glands → ducts → blood → tissues
   b. organs → arteries → capillaries → blood
   c. glands → blood → tissues
   d. glands → capillaries → blood

2. Testosterone and estrogen are examples of ________.
   f. neurotransmitters
   g. sex hormones
   h. sugars
   j. sex organs

3. Which is the order of stages of the human reproduction cycle?
   a. L, K, M, N
   b. K, L, M, N
   c. K, M, L, N
   d. L, N, M, K
4. The zygotes in Group T are different from the zygotes in Group S because only the zygotes in Group T will develop into ________.
   f. fraternal twins
g. maternal twins
h. identical twins
j. embryos

5. Which of these shows the process of ovulation?
   a. 
   b. 
   c. 
   d. 

6. Which of these belongs with the group above?
   f. scrotum
g. placenta
h. sperm
j. egg
During the first two months of pregnancy, the developing child is called an embryo. After this period, it is called

A. zygote
B. neo-embryo
C. fetus
D. baby

A similarity between the endocrine system and the nervous system is that they are both control systems. One difference is that the endocrine system

F. doesn’t react as quickly as the nervous system
G. is made up of many neurons
H. reacts more quickly than the nervous system
J. does not release hormones into the blood

If the blood contains too little or too much glucose, the endocrine system will respond by increasing or decreasing the glucose level. The endocrine system is a type of

A. positive feedback system
B. equilibrium feedback system
C. negative feedback system
D. neutral feedback system

Sperm and testosterone are produced in the

F. urethra
G. prostate gland
H. penis
J. testes

In which of the following does fertilization of an egg usually take place?

A. ovary
B. oviduct
C. placenta
D. cilia
Directions: Read Numbers 6–7 below. Then, on the lines that follow, write your answers in complete sentences.

6 Reproduction begins inside of the female body when a sperm fertilizes an egg. Describe the steps in reproduction, from fertilization of the egg to implantation of the embryo. Draw a diagram of the female reproductive system and show where the steps occur.

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________

7 Explain how a negative-feedback system works, using the endocrine system as an example.

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. Information about chlorophyll would most likely be found under which heading in a table of contents?
   a. Vascular Plants
   b. Nonvascular Plants
   c. Photosynthesis
   d. Root Systems

2. Which of the following would most likely grow first in the above habitat?
   f. green algae
   g. red maple trees
   h. orchids
   j. mosses

3. Which of these belongs with the group above?
   a. cambium
   b. cuticle
   c. guard cell
   d. chlorophyll

4. All of the following are examples of products made from plants EXCEPT ________.
   f. varnish
   g. chocolate
   h. sugar
   j. gelatin

5. Most plants will have all of the following structures EXCEPT ________.
   a. cell walls
   b. capillaries
   c. chloroplasts
   d. carotenoids
6. Under which heading in a table of contents would the most information about gymnosperms be found?
   f. The Spores of Ferns
   g. Evergreens and Conifers
   h. Fruit Trees
   j. The Wonder of Algae

7. Angiosperms are vascular, flowering plants with seed-containing fruit. According to this information, all of these plants are angiosperms EXCEPT ________.

   a. 
   b. 
   c. 
   d. 

8. Stomata are small openings in a leaf’s epidermis. Stomata could affect the health of a plant by ________.
   f. limiting the spread of disease-carrying spores into the plant’s systems
   g. limiting the amount of oxygen lost from plant systems
   h. allowing carbon dioxide, water, and oxygen to enter and exit the leaf
   j. allowing leaves to be lighter in weight and not break as a result of harsh winds

9. What kind of scientist would most likely study liverworts?
   a. botanist
   b. anthropologist
   c. oceanographer
   d. meteorologist

10. Lilly was gathering plant samples for a science project. She made observations of one of her plant samples. Which observation would mean that the plant sample was NOT a gymnosperm?
    f. seeds that are not protected by fruit
    g. a hard cone
    h. seeds that are contained in fruit
    j. needlelike leaves
Plants have chlorophyll. The chlorophyll usually helps the plants by

\[ \begin{align*}
\text{F} & \text{ disguising the plants from predators} \\
\text{G} & \text{ protecting the plants from sunlight} \\
\text{H} & \text{ capturing energy from sunlight} \\
\text{J} & \text{ absorbing oxygen from the air}
\end{align*} \]

This diagram shows the main parts of a plant. Which part of the plant is best adapted for capturing energy?

\[ \begin{align*}
\text{A} & \text{ 1} \\
\text{B} & \text{ 2} \\
\text{C} & \text{ 3} \\
\text{D} & \text{ 4}
\end{align*} \]
If scientists discover a new species of plant in the rain forest, they can use scientific tools and procedures to determine

F the chemical compounds the plant might contain
G the amount of oxygen it has produced over the years
H the plant’s future success
J the plant’s popularity among the local people

What type of plant would be best suited to the environment shown?

A a large plant with large leaves
B a small plant with large leaves
C a large plant with no leaves
D a small plant with small leaves

Directions: Read Number 6 below. Then, on the lines that follow, write your answer in complete sentences.

Many people are concerned that Earth’s rain forests are being cut down more quickly than they can be replaced. Based on your knowledge of the role that plants play in the global oxygen–carbon dioxide cycle, what effect might this loss of plants have?
1. The graph shows consumer/producer populations over several years. A reasonable hypothesis based on these data is that if the producer population decreases, then to _____.
   a. the predator population will increase
   b. the producer population will become extinct
   c. soil nutrients will decrease
   d. the consumer population will decrease

2. Which of these shows the food chain in the correct order?
   f. Zooplankton → Bear → Salmon
   g. Salmon → Zooplankton → Bear
   h. Zooplankton → Salmon → Bear
   j. Bear → Zooplankton → Salmon

3. Albert and George suspected that lawn fertilizer from their neighborhood was causing excessive algae to grow in the pond at the end of their street. Which of the following would be the best test of their hypothesis?
   a. Compare the growth of algae in ponds near fertilized lawns and other ponds near unfertilized lawns
   b. Compare the growth of algae in ponds near fertilized lawns in spring, summer, fall, and winter
   c. Conduct a neighborhood survey to find out what kind of fertilizers everyone uses
   d. Suggest that the neighborhood use more fertilizer to see if this results in an increase in algae

4. Officials are considering trying to establish an endangered plant species in a local wildlife preserve. Which questions will need to be answered first in order to determine the endangered plant’s chance of success?
   f. What are the long-range plans for development of the preserve?
   g. What are the plant’s biotic and abiotic requirements for survival?
   h. What is the plant’s seed-dispersal strategy?
   j. How many people visit each year?
5. The table above shows the total concentrations of nutrients measured in five farm ponds. Which of the graphs below best represents these data?

<table>
<thead>
<tr>
<th>Pond</th>
<th>Nutrient Concentration (ppt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>45</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>35</td>
</tr>
<tr>
<td>E</td>
<td>40</td>
</tr>
</tbody>
</table>

- a. 
- b. 
- c. 
- d.
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. The science of the environment, its components, and the interactions between these components is called
   A. ecology  
   B. geology  
   C. biology  
   D. physiology

2. Which of the following is not an abiotic environmental factor?
   F. air  
   G. animals  
   H. soil  
   J. water

3. A local network of plants, animals, and the surrounding environment is called
   A. a biosphere  
   B. an ecosystem  
   C. a symbiosis  
   D. nature

4. Sometimes a population cannot grow to its biotic potential due to environmental factors. What are these environmental factors called?
   F. limiting factors  
   G. biomes  
   H. ecological pyramids  
   J. carrying capacities

5. Some organisms in a typical Florida wetland are listed in the following table.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>insect</td>
<td>scraps</td>
</tr>
<tr>
<td>spider</td>
<td>insect</td>
</tr>
<tr>
<td>fish</td>
<td>spider</td>
</tr>
<tr>
<td>bird</td>
<td>fish</td>
</tr>
<tr>
<td>badger</td>
<td>fish</td>
</tr>
<tr>
<td>mouse</td>
<td>scraps</td>
</tr>
</tbody>
</table>

   Which of the following food webs represents the wetland ecosystem?
   A. mouse → insect → spider → badger → bird  
   B. mouse → insect → spider → bird → fish → badger  
   C. mouse → insect → spider → bird → fish → badger  
   D. scraps → insect → spider → fish → badger
6. Which of these is the ultimate source of energy in the energy pyramid?

- F water
- G air
- H sunlight
- J soil

7. Which of the following is not an important cycle of matter in the environment?

- A helium cycle
- B water cycle
- C carbon cycle
- D nitrogen cycle

8. A local company dumped sewage into the wetlands. As a result, most of the fish in the wetlands died. This decrease in the number of fish will probably result in

- F fewer mice
- G fewer birds
- H fewer spiders
- J fewer insects

Directions: Read Numbers 9 and 10 below. Then, on the lines that follow, write your answers in complete sentences.

9. Ecologists have arranged biotic and abiotic factors into the following organized levels: populations, communities, ecosystems, biomes, and the biosphere. Define each of these levels and note the interactions between different levels.

10. Matter cycles through ecosystems, getting used over and over again. Pick either the water cycle, carbon cycle, or nitrogen cycle. Describe the steps that occur as the matter cycles through an ecosystem.
1. Nonrenewable resources are natural resources that cannot be replaced quickly by nature when they get used up. According to this definition, which of these is a nonrenewable resource?

   a. 
   b. 
   c. 
   d. 

2. The pictures show simple smog-collecting disks hanging in four different locations. During the day, the sticky disks will catch smog at different rates. When left for one day, which location will have the most smog on its collecting disk?

   f. A
   g. B
   h. C
   j. D
3. The picture shows some natural resources. Which of the following is the major characteristic of all natural resources?
   a. They are parts of the environment that we need or use to live.
   b. They are parts of the environment that are found underground.
   c. They are parts of the environment that give us energy.
   d. They are parts of the environment that cannot be recycled or reused.

4. The picture shows models of some CFC molecules. Which of these is the major characteristic of CFC molecules?
   f. They contain pairs of chlorine atoms.
   g. They have a triangular shape.
   h. They react with each other.
   j. They contain carbon, chlorine, and fluorine atoms.

5. Scientists have invented new chemicals that can be used instead of CFCs in refrigerators and air conditioners. This may affect human health by ________.
   a. decreasing water pollution
   b. increasing the greenhouse effect
   c. decreasing the rate of ozone depletion
   d. increasing the number of cases of lung cancer

6. The scene in Picture A is different from the scene in Picture B because in Picture A the person is ________.
   f. leaving the grocery store with a box of cereal
   g. conserving fossil fuels by taking the bus to the grocery store
   h. conserving energy by using a plastic bag
   j. conserving resources by not using a plastic bag
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. Which of the following is considered a renewable resource?
   A. coal
   B. water
   C. soda can
   D. petroleum

2. Factory wastewater can be an environmental problem when it
   F. is released into the air around the factory
   G. is released into rivers and contaminates them
   H. is recycled into new materials
   J. is sent into the ozone layer

3. The evening news reports that modern technology is going to help reduce the problems of smog and the greenhouse effect. Which of these is the news report talking about?
   A. finding replacements for CFCs
   B. composting more garbage
   C. using alternatives to fossil fuels
   D. building containers for nuclear waste

Directions: This chart shows information from a pond collected over several months as its pH was changed by acid rain. Use the information in the chart to answer Numbers 4–5 below.

<table>
<thead>
<tr>
<th>Month</th>
<th>pH level</th>
<th>Number of fish</th>
<th>Number of lily pads</th>
<th>Visibility</th>
<th>Temp. (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>5.9</td>
<td>50</td>
<td>200</td>
<td>very cloudy</td>
<td>62</td>
</tr>
<tr>
<td>June</td>
<td>5.5</td>
<td>30</td>
<td>165</td>
<td>a little cloudy</td>
<td>64</td>
</tr>
<tr>
<td>July</td>
<td>4.9</td>
<td>20</td>
<td>100</td>
<td>clear</td>
<td>63</td>
</tr>
<tr>
<td>Aug.</td>
<td>4.2</td>
<td>5</td>
<td>33</td>
<td>clear</td>
<td>64</td>
</tr>
</tbody>
</table>

4. Which measurement did not seem to be affected by the pH of the pond?
   F. number of fish
   G. number of lily pads
   H. visibility
   J. temperature

5. A neighboring pond that is a similar size is somewhat cloudy and has 31 fish, 150 lily pads, and a temperature of 62°C. What is the most likely pH of this pond?
   A. 5.9
   B. 5.5
   C. 4.9
   D. 4.2
Engineers sometimes put solar panels in the roofs of buildings. These solar panels can be used to

F grow plants on the roof
G make stronger roofs
H make heat and electricity
J reduce the ozone layer hole

The waste from nuclear power plants must be handled according to special rules. Why are these precautions taken?

A to prevent radiation from leaking out
B to prevent people from slipping and falling
C to prevent people from being tired at work
D to prevent competition from other plants

Directions: Read Number 8 below. Then, on the lines that follow, write your answer in complete sentences.

Without the atmosphere, Earth would be freezing cold and unsuitable for life. Explain how the Sun, atmosphere, and Earth interact in the greenhouse effect to keep us warm. Draw a diagram to help explain your answer.
DIRECTIONS
Choose the best answer choice for each of the following questions.

1. The picture above shows how a student prepared for an experiment. Which of the following was probably the student’s hypothesis?
   a. The gas condenses into a liquid when heated.
   b. The liquid boils at low temperatures.
   c. The solid will become a liquid when cooled.
   d. The solid melts when heated.

2. Which of the following processes is occurring in all three pictures?
   f. condensation
   g. vaporization
   h. conservation
   j. measurement

3. Each of the following is a physical property of gasoline EXCEPT ________.
   a. it burns in an exothermic reaction
   b. it is less dense than water
   c. it has a strong and easily identifiable odor
   d. it evaporates quickly at room temperature

4. A student is investigating the law of conservation of mass. Her experiment with paper is shown. The law of conservation of mass and the student’s experiment suggest that the small pieces of paper ________.
   f. can serve as catalysts in most chemical reactions
   g. have melting and boiling points that are lower than the full sheet
   h. have the same amount of matter as the full sheet
   j. have new chemical properties
5. The experimental setup shows that the small beaker is filled with ice. At first, the large beaker is empty. Where did the water in the large beaker probably come from?
   a. water condensing on the small beaker's surface dripping down
   b. melted ice dripping down through a crack in the small beaker
   c. a chemical reaction between the ice and the glass of the beaker
   d. water condensing on the inside of the large beaker

6. Sublimation is when a solid turns directly into a gas. Which of the following is a picture of sublimation?
   a. ![Image of sublimation](f)
   b. ![Image of sublimation](g)
   c. ![Image of sublimation](h)
   d. ![Image of sublimation](j)

7. Which of the following hypotheses is tested by the experimental data in the table above?
   a. Although matter undergoes change, mass is conserved.
   b. Given enough heat and time, chemical reactions can consume matter.
   c. Copper, gold, and silver all melt below 1,000°C.
   d. Metals take hours to melt.

8. Thermometers are mercury-filled glass tubes that are sealed at both ends. The mercury indicates the temperature through a __________.
   a. chemical change
   b. exothermic reaction
   c. physical change
   d. catalytic reaction

Observations of Three Elements

<table>
<thead>
<tr>
<th>Element</th>
<th>Melting Point</th>
<th>Weight Before Heating</th>
<th>Duration of Heating (minutes)</th>
<th>Weight After Heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>1,083°C</td>
<td>30 g</td>
<td>45</td>
<td>30 g</td>
</tr>
<tr>
<td>Gold</td>
<td>1,064°C</td>
<td>30 g</td>
<td>45</td>
<td>30 g</td>
</tr>
<tr>
<td>Silver</td>
<td>962°C</td>
<td>30 g</td>
<td>45</td>
<td>30 g</td>
</tr>
</tbody>
</table>
Wood is a complex material made of many substances. Which of the following does not occur as a result of a physical change in wood?

A. It floats in water.
B. It is broken into pieces.
C. It is sculpted into art.
D. It turns to ash.

A biologist grows a plant inside a sealed glass jar. The plant keeps growing for several days but then dies. At the start of the experiment, the jar had a mass of 3 kg. At the end of the experiment, it still had a mass of 3 kg. Which of the following explains why the mass was the same?

F. The plant created mass.
G. The jar’s temperature was the same as before.
H. The jar was sealed and new mass could not enter.
J. The plant did not grow enough to add mass to the jar.

What can you conclude about the above reaction?

A. It releases heat.
B. It releases light.
C. It absorbs heat.
D. It needs air.

Water molecules are each made of two hydrogen atoms and one oxygen atom. Under the right conditions, however, the atoms can be separated. This type of change in a substance’s properties is

F. rare
G. chemical
H. physical
J. never reversible
5 Scientists study the characteristics of substances to better understand the natural world. Which of the following is not a physical or chemical characteristic of a substance?

- A odor
- B cost
- C density
- D color

6 A student adds a powder to a clear liquid and the powder disappears. Which of these statements is true?

- F The particles the solid is made of are too small to be seen.
- G The liquid is blocking the student’s view of the powder.
- H The solid’s particles no longer exist.
- J The powder has evaporated.

Directions: Read Numbers 7–8 below. Then, on the lines that follow, write your answers in complete sentences.

7 Chemical reactions are important to living organisms for many reasons. Discuss some examples of chemical reactions on which living organisms depend.

8 Water can be frozen or boiled. Discuss the differences and similarities of the states of matter using water as an example.
DIRECTIONS

Choose the best answer choice for each of the following questions.

1. According to the diagram, which statement best describes what happens to ionic compounds when they are dissolved?
   a. They are pulled apart by water molecules.
   b. They get larger in size.
   c. They move faster.
   d. They become a new compound.

2. Erikka wanted to find out if more sugar dissolves in hot water or in cold water. She put one spoonful of sugar in the hot water and six spoonfuls of sugar in the cold water. She stirred both containers to see how much sugar dissolved. Her experiment could be improved by
   f. using salt instead of sugar
   g. using just cold water
   h. using the same amount of sugar in both containers
   j. using a larger amount of hot water than cold water

3. These pictures show different substances being tested for pH. Which of the following lists the substances from most acidic to most basic?
   a. Q, S, R, T
   b. T, S, R, Q
   c. Q, R, S, T
   d. T, R, S, Q
4. Carlos sets a warm saltwater solution on the table to cool. One hour later, he returns to find some white crystals forming at the bottom of the glass. The crystals most likely

f. fell into the glass from the ceiling

g. crystallized out of the cooling solution

h. are pieces of ice appearing as the water cools

j. will be something other than salt crystals

---

5. The chart shows the amount of different compounds that can be dissolved in 100 g of water at 25°C. Which of these graphs best represents these data?

<table>
<thead>
<tr>
<th>Compound</th>
<th>Solubility at 25°C (g/100g water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum sulfate</td>
<td>31</td>
</tr>
<tr>
<td>Chromium trioxide</td>
<td>62</td>
</tr>
<tr>
<td>Nickel bromide</td>
<td>113</td>
</tr>
<tr>
<td>Potassium hydrogen sulfate</td>
<td>36</td>
</tr>
<tr>
<td>Sodium carbonate</td>
<td>7</td>
</tr>
</tbody>
</table>

---

STOP
1. Which sentence best describes a saturated solution?

A. A saturated solution is a solution that fills a container to the top.
B. A saturated solution is a solution that contains as much solute as it can.
C. A saturated solution contains 100 g of solute in 100 g of solvent.
D. A saturated solution is a solution of solids dissolved in liquids.

2. A scientist wants to make a very concentrated sugar water solution. She heats the water before adding the sugar because

F. sugar is less soluble in warm water than in cold water
G. then the sugar will dissolve more slowly
H. sugar only dissolves in boiling water
J. sugar is more soluble in warm water than in cold water

3. Some solutions are sour tasting, conduct electricity, and can corrode and burn skin and tissue. These are characteristics of

A. acidic solutions
B. basic solutions
C. precipitates
D. soluble solutions

4. Some compounds react with acids and bases to produce different colors. These compounds are called

F. hydronium ions
G. precipitates
H. indicators
J. stalagmites

DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.
Marcia drops some salt in water and stirs until the salt dissolves. She drops some oil in water and stirs, but the oil does not dissolve. Explain why water can dissolve some substances such as sugar but can’t dissolve oil. Use the phrase “like dissolves like” in your explanation.
DIRECTIONS
Read each question and choose the best answer. Then fill in the correct answer on your answer document.

1. What is probably being measured in this experiment?
   a. Surface tension
   b. Density
   c. Vaporization
   d. Viscosity

2. Based on the behavior of matter, which of these would take the shape of the container it was placed in?
   f. Amorphous solid
   g. Crystalline solid
   h. Liquid
   j. Hydrogen atom

3. Which of these facts best explains why a baseball maintains its shape?
   a. Its melting point is close to room temperature.
   b. Its particles are packed tightly.
   c. Gases have loosely packed particles.
   d. Solids can never change shape.
4. Which is the order of the change in the state of water starting as a solid and then undergoing the process of vaporization?
   f. W, Y, X, Z
   g. Z, Y, X, W
   h. X, W, Y, Z
   j. X, W, Z, Y

5. This picture shows a type of insect called a water strider. The water strider is able to move on the water due to _______.
   a. thermal energy
   b. condensation
   c. surface tension
   d. melting

6. Sometimes factories dump hot water into nearby streams and rivers. This dumping of hot water could affect the ecosystem by _______.
   f. increasing the amount of pollution
   g. increasing the temperature of the water
   h. decreasing the amount of pollution
   j. decreasing the amount of water
DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.

1. Julie is learning about the states of matter by going through her home and identifying different states of matter. She should identify her shampoo as a
   A. vapor
   B. gas
   C. liquid
   D. solid

2. Which of these is measured with a thermometer?
   F. specific heat
   G. condensation
   H. vaporization
   J. temperature

3. Condensation happens when a gas changes into a liquid. Which of these is an example of condensation?
   A. water vapor turning to rain
   B. water vapor turning to snow
   C. a pond melting in the spring
   D. a pond freezing in the winter

4. A piece of chocolate is left in a hot car. What process causes it to become soft?
   F. condensation
   G. vaporization
   H. freezing
   J. melting

5. An object will float in liquids that are more dense than it is. Ice floats on water because it
   A. cools the water
   B. freezes the water
   C. is less dense than the water
   D. is more dense than the water
Directions: Read Numbers 6–7 below. Then, on the lines that follow, write your answers in complete sentences.

6 Darren and his father drove to the pool on a hot summer day. By the time they finished swimming and returned to the car, it had become very hot. However, some parts were hotter than others. Explain why this happened.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

7 Describe an example of surface tension. Explain how surface tension can exert force on objects.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
1. According to this information, which car type has a final speed for the quarter mile greater than 100 mph?
   a. Subcompact  
   b. Compact  
   c. Full Size  
   d. Performance

2. Mark wanted to find out which ball would roll farther. He hit a golf ball with a putter and measured how far it rolled. He then asked his little sister to roll a tennis ball across the floor and measured how far it rolled. His experiment could be improved by —
   f. measuring the time it took the balls to come to a complete stop  
   g. hitting both balls with the putter using the same force  
   h. measuring the mass of each ball on a balance  
   j. rolling the tennis ball across the floor himself

3. Parachutes save people’s lives by increasing the friction due to air resistance as they fall to Earth. Which of these drawings shows a parachute with a shape that would allow it to fall most slowly through the air with the greatest resistance?

   a  
   b  
   c  
   d

GO ON
4. If Mai-Ling were to drive 78 highway miles, about how many gallons of gas would she use?
   f. 3 gallons  
g. 5 gallons  
h. 16 gallons  
j. 25 gallons

5. Carmen set a square piece of glass atop a beaker. She placed a metal cube on top of the glass. In one quick motion, she pulled the piece of glass away. The metal cube dropped into the beaker. The metal cube most likely fell down into the beaker because —
   a. for every action, there is an equal and opposite reaction  
b. the acceleration of an object depends on the mass of the object and the force applied to it  
c. an object in motion tends to stay in motion, while an object at rest tends to stay at rest  
d. sliding friction is less than rolling friction

6. The chart shows the fuel economy of five SUVs. Which of these graphs best represents these data?

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine size</td>
<td>4.3</td>
<td>4</td>
<td>4.7</td>
<td>3.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Cylinders</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>City</td>
<td>16</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Highway</td>
<td>20</td>
<td>20</td>
<td>19</td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>
Newton and Education

Sir Isaac Newton was one of the most important scientists in history. He made remarkable advances in optics, mechanics, mathematics, and the study of motion and gravity. His research resulted in such great achievements as the law of universal gravitation. Newton made several of these scientific achievements while still a college student. After completing his formal studies, Newton continued to be active in the field of education, working as an instructor and as an advocate.

Newton's Early Education

Newton was born in 1643 to a wealthy but uneducated family. Although Newton’s father owned much property and many animals, he was illiterate and could not sign his own name. In 1642, Newton’s father died, and in 1653, his stepfather died. As a result of these hardships, Newton did not begin to attend the Free Grammar School until the age of ten. Shortly after, Newton was pulled from school in order to manage the affairs of his deceased father and stepfather.

In 1660, Newton returned to the Free Grammar School to complete his education. During his previous attendance, Newton’s school reports indicated that he was a poor student. But after he returned, Newton began to show great academic promise. He was passionate about learning and diligently applied himself to his studies.

Advanced Studies at Cambridge

In 1661, Newton entered Trinity College Cambridge, intending to achieve a degree in law. During his time at Cambridge, Newton studied Descartes, whose philosophies on optics would later assist Newton’s discoveries. In 1663, while reading an astrology book purchased at a local fair, Newton found out that he could not understand the math used in the book. By attempting further studies in math, Newton discovered that he did not understand basic trigonometry nor basic geometry. This personal discovery led Newton to apply himself to the subject of mathematics. By reading books such as Euclid’s *Elements* and Wallis’s *Algebra*, Newton taught himself mathematics.

After experiencing some success in his studies, Newton’s education was challenged again—Cambridge closed for two years due to the bubonic plague. During that time, Newton conducted his own research and developed the foundations for differential and integral calculus. When he returned to Cambridge, Newton was awarded fellowships, bestowed with his Master’s degree, and appointed to an honorary professorship.

Working as an Advocate

In 1685, James II became king of Great Britain. As a result of his bias against Protestants, James II appointed only Roman Catholics to high positions in the army, judiciary system, state governments, and universities. Newton wrote many papers against the king’s policy, defending the Protestant professors at Cambridge. Newton became famous for his active defense of Cambridge against the king’s policies, and Cambridge elected Newton to the Convention Parliament. As a member of the Convention Parliament, Newton traveled to London with other elected officials and worked to remove James II from power and to give the throne to William of Orange.

Sir Isaac Newton worked through many educational hardships and challenges. Through his studies, Newton achieved great scientific discoveries that are still honored and respected. In addition, he worked to protect the educational opportunities of others. Newton will continue to be known for his academic successes, both as a scientist and as an advocate.
Newton could not attend Cambridge for two years because —

A the school closed due to the bubonic plague
B Newton’s family could not afford to send him
C James II would not allow him to attend
D Newton’s understanding of math was too poor

Which of these is an FACT in this passage?

F Newton entered Trinity College Cambridge in 1685.
G Newton learned more from Euclid’s Elements than from Wallis’s Algebra.
H Newton began attending the Free Grammar School when he was ten.
J Newton was the most important scientist in history.

Based on information in the passage, the reader can conclude that —

A In the 1600s, all children began to attend school at the age of ten.
B studying math is more interesting than studying law
C Trinity College Cambridge is in Great Britain
D the study of astrology always uses very advanced math

Which of these best describes Newton?

F Quiet
G Playful
H Hardworking
J Affectionate

The author’s purpose in this passage is to —

A convince the reader to read Euclid’s Elements
B persuade the reader to attend Trinity College Cambridge
C explain Newton’s experiments in detail
D recount Newton’s experiences with education
1. The diagram shows the energy changes in a _______.
   a. coal power plant
   b. nuclear power plant
   c. hydroelectric power plant
   d. solar power plant

2. The picture shows examples of nonrenewable energy resources. Which of these is the major characteristic of nonrenewable energy resources?
   f. They will eventually run out.
   g. They are inexhaustible.
   h. They are made by humans.
   j. They are used only in cars.

3. What is the energy transformation occurring in this picture?
   a. Chemical energy —> potential energy
   b. Light energy —> electrical energy
   c. Electrical energy —> light energy
   d. Wind energy —> electrical energy

4. In general, hydroelectric dams disrupt the life of aquatic animals the most by _______.
   f. producing energy by harnessing the power of water
   g. sending damaging electrical currents into waterways
   h. having fish travel around dams by using fish ladders
   j. hindering aquatic life from traveling to spawning areas
5. Which photovoltaic device is probably creating the most usable energy?

a. 

b. 

c. 

d. 

6. Which organism is acting most like a photovoltaic cell in a solar heating panel?

f. 

g. 

h. 

j.
1. Which is the best definition of kinetic energy?
   A. Kinetic energy is stored energy.
   B. Kinetic energy is energy of motion.
   C. All forms of energy are kinetic energy.
   D. Only living things can have kinetic energy.

2. There is energy stored inside the molecules of food that we eat. This energy is classified as
   F. chemical energy
   G. eating energy
   H. kinetic energy
   J. nuclear energy

3. Which of the following is not a renewable energy source?
   A. solar energy
   B. wind energy
   C. geothermal energy
   D. fossil fuels

4. Which of the following would be used to measure the average kinetic energy of the particles in an object?
   F
   G
   H
   J

DIRECTIONS
Read each question. Then, on your answer sheet, mark the answer choice that you think is best.
Which of the balls described below would have the most kinetic energy?

A a bowling ball standing still on the floor
B a basketball resting on a chair
C a golf ball flying through the air
D a tennis ball rolling to a stop on the ground

Although people once thought hydroelectric power did no harm to the environment, it is now known that building dams for hydroelectric power plants

F increases global warming
G interferes with the habitats of fish
H causes the hole in the ozone layer
J causes acid rain

Directions: Read Number 7 below. Then, on the lines that follow, write your answer in complete sentences.

Hank puts a battery in his radio and listens to music all afternoon. At the end of the day there is no more energy in the battery. Use the law of conservation of energy to explain what happened to the battery’s energy. Include any energy transformations in your answer.