SC.6.L.14.1 Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.

SC.6.L.14.2 Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multicellular), all cells come from preexisting cells, and cells are the basic unit of life.

SC.6.L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.

SC.6.L.14.4 Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.

SC.6.L.14.5 Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.

SC.6.L.14.6 Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.

SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Luis is making a chart of compounds that are found in the human body. What is the most common compound found in the human body?
   A. water
   B. table salt
   C. carbon dioxide
   D. sodium bicarbonate

2. Kayla has a cat with blue eyes. The color of her cat’s eyes is determined by deoxyribonucleic acid (DNA). The DNA directs which substance to construct these eyes?
   A. lipids
   B. water
   C. proteins
   D. carbohydrates

3. Carbohydrates are made up of three of the six major molecules found in living things. The general chemical formula for a carbohydrate is \( \text{CH}_2\text{O} \). Which elements combine to make a carbohydrate?
   A. copper and cobalt
   B. chlorine and oxygen
   C. carbon, helium, and oxygen
   D. carbon, hydrogen, and oxygen

4. Ling is planning a long hike. To make sure his body has sufficient water, he packs two bottles of water. What happens to body cells that lose too much water?
   A. The cells shrivel and die.
   B. The cells swell and burst.
   C. The cells are not affected.
   D. The cells absorb nutrients more efficiently.
5. Alejandro is doing a science experiment. He is given a substance containing one of the four main molecules found in the cells of living things. He needs to find out what kind of molecule the substance is made of. He adds a few drops of the molecule to water.

Based on the fact that it does **not** mix with water, what can Alejandro conclude about the molecule?

A. It is a lipid.
B. It is a protein.
C. It is a nucleic acid.
D. It is a carbohydrate.

6. Imagine a cell that has the shape of a cube with edges that are 3 cm long. Use the following equation below, to find the surface-area-to-volume ratio of this cell.

\[
\frac{\text{surface area}}{\text{volume}} = \frac{\text{surface area}}{\text{volume}}
\]

A. 27 cm\(^3\)
B. 54 cm\(^2\)
C. 27 : 54
D. 54 : 27

7. Eukaryotic cells and prokaryotic cells have some parts in common. Which of the following pairs of parts would you find in both types of cells?

A. cytoplasm and nucleus
B. cell membrane and cytoplasm
C. DNA and membrane-bound organelles
D. cell membrane and membrane-bound organelles

8. The following picture shows a prokaryotic organism.

What part of the organism is labeled A?

A. DNA
B. cytoplasm
C. cell membrane
D. membrane-bound organelle
9. Eukaryotic cells and prokaryotic cells have some parts that are different. Which of the following would you find only in a eukaryotic cell?

A. membrane-bound organelles and a nucleus
B. a nucleus and organelles without membranes
C. a cell membrane and organelles without membranes
D. membrane-bound organelles and DNA in cytoplasm

10. Some organisms have one cell. Other organisms have multiple cells. Which of the following is a characteristic of cells in a multicellular organism?

A. All cells have the same function.
B. Every cell has a different function.
C. Different kinds of cells have the same function.
D. Different kinds of cells have different functions.

11. In multicellular organisms, cells form tissues. In turn, tissues form organs, and organs form organ systems. What is an important job of all of these tissues, organs, and organ systems?

A. to maintain homeostasis
B. to make sugars for energy
C. to transport nutrients in the body
D. to take in nutrients and eliminate wastes

12. Some cells in multicellular organisms are constantly dividing. What is one reason why cells divide?

A. so that an organism can eliminate wastes
B. so that an organism can grow by adding new cells
C. so that an organism can obtain the energy that it needs
D. so that an organism can exchange materials with its environment

13. Janine drew the following diagram to show a cell process. Notice that this process includes four stages, represented by labels G1, S, G2, and M. Label M indicates when mitosis happens during this process.

What process is Janine illustrating in her diagram?

A. the cell cycle
B. exocytosis
C. endocytosis
D. cellular respiration
14. Pedro examines a tissue sample under a high-powered microscope. He makes a sketch in his lab notebook of one of the cells he observes. His sketch is shown here.

Which label should Pedro use for structure A?
A. cytoskeleton
B. lysosome
C. mitochondrion
D. nucleus

15. Under a high-powered microscope, Dan sees a cellular organelle. The organelle has a double membrane, and the inner membrane is folded. He runs a test on the organelle and finds that it contains DNA. Which organelle does Dan see?
A. endoplasmic reticulum
B. mitochondrion
C. nucleus
D. ribosome

16. Lisa and Vinay are studying cells under a microscope. They both notice a certain structure. Lisa concludes that this structure is rough endoplasmic reticulum, but Vinay concludes that it is the Golgi complex. Which of the following choices describes a way to support one of their conclusions?
A. Lisa’s conclusion would be supported if they observed that the structure contains DNA.
B. Lisa’s conclusion would be supported if they observed ribosomes present on the structure.
C. Vinay’s conclusion would be supported if they observed that the structure produces ATP molecules.
D. Vinay’s conclusion would be supported if they observed that the structure carries out photosynthesis

17. Hakeem observes an organelle in a cell under a microscope. He notices that the organelle has a double membrane. Which of the following describes what Hakeem could have observed?
A. He could have observed a cell wall or a vacuole.
B. He could have observed a chloroplast or a lysosome.
C. He could have observed a ribosome or a mitochondrion.
D. He could have observed a mitochondrion or a chloroplast.
18. Mariella is studying a new type of organism that she has found. She observes that the cells of the organism have ribosomes, mitochondria, and lysosomes. She also observes that the cells do not have a cell wall. What type of organism is Mariella **most likely** to have found?
   A. a plant
   B. a fungus
   C. an animal
   D. a prokaryote

19. When virus particles enter a person's body, the body responds by following a specific pattern. Which of the following steps happens **earliest** in the fight against an invading virus?
   A. Viral particles are engulfed by macrophages.
   B. B cells divide to make cells that can make antibodies.
   C. Helper T cells recognize the viral antigens on macrophages.
   D. Killer T cells recognize viral antigens and destroy the infected cells.

20. The male reproductive system produces and stores sperm cells. What is the function of the epididymis in this system?
   A. make sperm
   B. store sperm
   C. make testosterone
   D. store testosterone

21. At puberty, hormones encourage the development of sexual characteristics. Hormones also aid in reproduction. Which of the following are female sex hormones?
   A. corpus luteum
   B. gonads, gametes
   C. estrogen, progesterone
   D. androgens, testosterone

22. Jeff fell while playing basketball and dislocated his shoulder. Jeff's doctor told him that he had injured an important part of his skeletal system. But luckily, it will heal quickly. What part of the skeletal system is injured when a shoulder is dislocated?
   A. joint
   B. spongy bone
   C. bone marrow
   D. compact bone

23. The human muscular system can suffer injury or disease. Which of the following is most likely caused by a person's heredity?
   A. tendonitis
   B. muscular dystrophy
   C. a muscle strain
   D. a muscle tear
24. Study the following picture.

Which mode of infectious disease transmission does this picture show?

A. animal to person  
B. person to person  
C. contaminated object  
D. contaminated water or food

25. Why is good personal hygiene important for limiting the spread of disease?

A. Regular bathing makes it impossible for any bacteria to grow on the skin.
B. Keeping the body clean and taking antibiotics every day can prevent a person from ever getting sick.
C. Washing the skin removes all disease-causing bacteria and leaves beneficial bacteria in place.
D. Showering and brushing the teeth reduce the number of bacteria and other pathogens in and on the body.

26. Joaquin's teacher gives him a list and a branching diagram. She asks Joaquin to match the numbers on the diagram to the characteristics on the list.

<table>
<thead>
<tr>
<th>Joaquin's list</th>
</tr>
</thead>
<tbody>
<tr>
<td>spinal cord</td>
</tr>
<tr>
<td>teeth for eating meat</td>
</tr>
<tr>
<td>hair and mammary glands</td>
</tr>
<tr>
<td>jaws and vertebral column</td>
</tr>
<tr>
<td>eggs with internal membrane</td>
</tr>
</tbody>
</table>

What characteristic should appear at point 4?

A. spinal cord  
B. teeth for eating meat  
C. hair and mammary glands  
D. jaws and vertebral column
27. During a laboratory project, Sunita and William use a dichotomous key to identify different insects. The dichotomous key and one of the insects they need to identify are shown in the following figure.

<table>
<thead>
<tr>
<th>Simple Dichotomous Key for Insects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

In what step of the dichotomous key will Sunita and William identify the insect?

A. step 1
B. step 2
C. step 5
D. step 6

28. During a field experiment, Thuy collects four different leaves, as shown in the following figure. After the trip, Thuy makes a dichotomous key to identify each of the trees from which the leaves were collected.

Which of the following pairs of statements would be the best first step in Thuy’s dichotomous key?

A. a. Leaf is large.
   b. Leaf is small.
B. a. Leaf has rough edges.
   b. Leaf has smooth edges.
C. a. Leaf has pointed lobes.
   b. Leaf has rounded lobes.
D. a. Leaf has one main vein.
   b. Leaf has more than one main vein.
29. Selena’s teacher shows the class photographs of four different animals. The class has 1 min to write down the physical characteristics of an animal as they view its photo. Selena makes her notes in the following table.

<table>
<thead>
<tr>
<th>Animal 1</th>
<th>Animal 2</th>
<th>Animal 3</th>
<th>Animal 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• has gills</td>
<td>• has gills</td>
<td>• has one fin on its back</td>
<td>• has fur</td>
</tr>
<tr>
<td>• has scales</td>
<td>• has very shiny scales</td>
<td>• has flat tail</td>
<td>• has four feet</td>
</tr>
<tr>
<td>• has a vertical tail fin</td>
<td>• has vertical tail fin</td>
<td>• has one set of paired flippers</td>
<td>• has flipper like rear feet</td>
</tr>
<tr>
<td>• has one large fin and one small fin on its back</td>
<td>• has one fin on its back</td>
<td>• has smooth skin</td>
<td>• has whiskers</td>
</tr>
<tr>
<td>• has one set of paired fins</td>
<td>• has one set of paired fins</td>
<td>• has long, skinny nose</td>
<td>• has sharp teeth</td>
</tr>
<tr>
<td>• has two single fins on bottom</td>
<td>• has one fin on bottom</td>
<td>• has blowhole in top of head</td>
<td>• is mostly black with</td>
</tr>
<tr>
<td>• fins are spiny</td>
<td>• has saw-like ridges on back and bottom</td>
<td>• is gray colored</td>
<td>lighter-colored head</td>
</tr>
<tr>
<td>• is dark colored</td>
<td>behind the fins</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on Selena’s notes, which two animals may be more closely related to each other than to the other animals?

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

30. Hank discovers a new squirrel that lives near another group of squirrels. The new squirrels have very distinct fur colors and have slightly different ears and tails. Otherwise they look much the same physically as the other group of squirrels. How can Hank best determine if the new squirrels belong to the same species as the other group of squirrels?

A. He could study their diets.
B. He could study their behavior.
C. He could study their genetic material.
D. He could study their internal physical structures.
**Physical**

**SC.6.P.13.1 Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.**

**SC.8.P.8.2 Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.**

**SC.6.P.13.2 Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.**

**SC.6.P.13.3 Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.**

**SC.6.P.12.1 Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.**

**Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

1. Luis is pushing a box of new soccer balls across the floor. In the following picture, the arrow on the box is a vector representing the force Luis exerted.

   ![Vector Diagram](image)

   What do the length and direction of the arrow represent?

   **A.** the distance and direction of the motion of the box
   **B.** the strength and direction of the force applied to the box
   **C.** the motion of the box and the direction of the force applied to it
   **D.** the strength and direction of the unbalanced force applied to the box

2. A rocket burns fuel to create hot gases that explode violently out of the rocket engine. This explosion creates thrust. Thrust is a force that pushes the rocket upward. What force must thrust overcome in order to send a rocket up into space?

   **A.** gravity acting on the rocket
   **B.** gravity acting on the exploding gases
   **C.** friction between the rocket and the ground
   **D.** friction between the rocket and the exploding gases
3. In order for a space shuttle to leave Earth, it must produce a great amount of thrust. Its rocket boosters create this thrusting force by burning great amounts of fuel. However, once in space, the shuttle needs very little fuel. It circles Earth while gravity pulls it toward Earth. What term describes the circular path the shuttle makes in space?
   A. orbit
   B. gravity
   C. free fall
   D. weight

4. Justin drew the following diagram of the orbits of several objects in space.

   ![Diagram of orbits]

   What keeps object A in orbit around object B?
   A. the force of gravity between objects A and B
   B. the force of gravity between objects A and C
   C. the force of gravity between objects A and E
   D. the force of gravity between objects B and X

5. The diagram shows the components of motion that affect an object in orbit around a planet.

   ![Diagram of motion components]

   How is the dotted arrow related to the two solid arrows?
   A. It shows the path the object would take if it had no inertia.
   B. It shows the path the object would take if there were no gravity.
   C. It shows the path the object would take if the object were not in motion.
   D. It shows the path the object takes because of its motions from inertia and gravity.

6. Measuring acceleration requires the appropriate units. Scientists measure acceleration using a standardized set of units that are part of the SI system. Which are SI units for acceleration?
   A. N
   B. m/s
   C. m/s^2
   D. kg·m/s

7. In science, some quantities are known as vectors. Acceleration is one type of vector. Which of the following would identify an acceleration vector?
   A. 5 m/s
   B. 8 m/s south
   C. 5 m/s^2
   D. 5 m/s^2 south
8. Elizabeth is a wildlife biologist. She traveled by boat in the Everglades to observe alligators. The following graphs show the motion of her boat at several times during the trip.

Which graph shows her boat traveling when it is not accelerating?

A. graph A  
B. graph B  
C. graph C  
D. graph D

9. Imagine a weightless box floating in space. The following picture shows all the forces acting on this box.

In what direction will this box accelerate?

A.  
B.  
C.  
D.
10. Imagine a box floating in space. The following picture shows all the forces acting on this box.

What is the vertical force on this box?

A. –100 N upward  
B. –50 N upward  
C. 50 N upward  
D. 100 N upward

11. A box of books is on the floor. The following picture shows a push and a pull acting on the box.

What is the net force toward the right on the box?

A. 0 N  
B. 50 N  
C. 100 N  
D. 2,500 N

12. Imaging that a chair on the floor experiences two horizontal forces. One force measures 200 N and the other force measures –200 N. Which of the following statements describes what is happening to the object?

A. The object is moving.  
B. The object is not moving.  
C. The object’s motion is changing.  
D. The object’s motion is not changing.
13. Two balls are falling from the same ledge. One ball falls straight down. The other ball is moving horizontally when it leaves the ledge.

Which of the following statements describes the amount of time needed for the balls to reach the ground?

A. The balls hit the ground at the same time because gravity is the only unbalanced force acting on them.
B. The ball that is falling straight down from the ledge hits the ground first because it does not travel as far.
C. The ball with more mass will hit the ground first because it experiences more acceleration due to gravity.
D. The ball that is moving horizontally away from the ledge hits the ground first because it experiences acceleration in both directions.

14. The following picture shows the path followed by two balls. One is dropped from the ledge. The other ball is rolled off the ledge.

Why don't both balls fall straight down?

A. The ball that is moving to the right continues to experience a force in that direction.
B. The ball that is moving to the right keeps moving to the right until gravitational force acts on it.
C. The force causing the ball to move to the right stops after a few seconds, and then the ball drops straight down.
D. The horizontal motion of the ball moving to the right balances the force of gravity, so the ball does not fall as quickly.
15. During a baseball game, a hitter strikes the ball with a bat. When this happens, the ball and the bat each exert a force on the other. Why does the ball accelerate away from the bat more than the bat accelerates away from the ball?

A. The ball has less mass, so an equal force causes greater acceleration on the ball.
B. The ball has less mass, so it exerts less force on the bat than the bat exerts on the ball.
C. The ball has greater velocity before the collision, so force affects the ball more than the bat.
D. The bat exerts more force than the ball because the batter is exerting a force on the bat as it hits the ball.

16. In a swimming race, Miho swam the first 50 m in 42 s. She swam the second 50 m in 40 s. What was Miho’s average speed during the race?

A. 0.82 m/s
B. 1.19 m/s
C. 1.22 m/s
D. 1.25 m/s

17. Joanna’s family drove 360 km to visit relatives in Jacksonville. Joanna recorded the distance they traveled each hour. The entire trip took 8 h.

What was the average speed during the last 3 h of the trip?

A. 45 km/h
B. 60 km/h
C. 120 km/h
D. 180 km/h

18. Montez read that bobcats can reach speeds of up to 30 mi/h. What does the speed of a bobcat indicate?

A. the time it takes to reach its maximum speed
B. the total amount of time it travels in one direction
C. the distance it travels to move between two points
D. the distance it can travel in a certain amount of time

19. Masato is practicing his serve for a tennis match. His coach measures the speed of the ball just after Masato hits it. What does the speed indicate?

A. how fast the ball is moving
B. what direction the ball moves
C. what distance the ball has traveled
D. how long the ball takes to reach the net
20. Sita is on the school diving team. She drew the diagram below to show the path she takes when she dives.

When Sita is at the highest point, she is 12 m above the pool. Which of the following does this statement describe?
A. motion
B. path
C. position
D. speed

21. The following picture shows an object resting on a balance.

With what force does the object push down on the balance?
A. 0.500 kg·m/s²
B. 4.90 kg·m/s²
C. 9.3 kg·m/s²
D. 9.8 kg·m/s²

22. The following table lists the weights and volumes of several items.

<table>
<thead>
<tr>
<th>Object</th>
<th>Mass (g)</th>
<th>Volume (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bowling ball</td>
<td>3,600</td>
<td>5,400</td>
</tr>
<tr>
<td>golf ball</td>
<td>60</td>
<td>33</td>
</tr>
<tr>
<td>soccer ball</td>
<td>450</td>
<td>5,400</td>
</tr>
<tr>
<td>tennis ball</td>
<td>60</td>
<td>130</td>
</tr>
</tbody>
</table>

Which object has the greatest force of gravity acting on it?
A. bowling ball
B. golf ball
C. soccer ball
D. tennis ball
23. The objects shown in the following diagrams have different masses and are different distances apart. Which diagram shows the two objects that have the greatest force of gravity acting between them?

A. 

![Diagram A](image1.png)

B. 

![Diagram B](image2.png)

C. 

![Diagram C](image3.png)

D. 

![Diagram D](image4.png)

24. High and low tides are the regular pattern of rising and sinking ocean-water levels. They are caused when the sun’s gravity and the moon’s gravity pull on ocean water. The moon’s gravity has a greater effect on Earth’s oceans than the sun’s gravity. Why would the moon have a greater effect than the sun?

A. The moon is not as hot as the sun.
B. The moon has less mass than Earth.
C. The moon has less mass than the sun.
D. The moon is closer to Earth than the sun.

25. The following diagram shows a satellite in orbit around Earth.

![Diagram of Satellite](image5.png)

Which arrow shows the direction of the force that keeps the satellite in its circular path around Earth?

A. arrow A
B. arrow B
C. arrow C
D. arrow D
SC.6.E.7.4 Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.
SC.6.E.7.2 Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.
SC.6.E.7.3 Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.
SC.6.E.7.6 Differentiate between weather and climate.
SC.6.E.7.9 Describe how the composition and structure of the atmosphere protects life and insulates the planet.
SC.6.E.7.5 Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.
SC.6.E.7.1 Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth’s system.

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. The continent of Antarctica is covered with an ice sheet. Which part of the Earth system includes the ice sheet?
   A. biosphere
   B. cryosphere
   C. hydrosphere
   D. atmosphere

2. Living things in the biosphere interact with other parts of the Earth system to exchange energy. Which picture represents the basic source of energy for the biosphere?
   A.
   B.
   C.
   D.

3. The table below shows the amount of Earth’s freshwater in several kinds of locations.

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimated volume (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater</td>
<td>8,000,000</td>
</tr>
<tr>
<td>Lakes</td>
<td>125,000</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>13,000</td>
</tr>
<tr>
<td>Wetlands</td>
<td>11,500</td>
</tr>
<tr>
<td>Rivers</td>
<td>1,000</td>
</tr>
</tbody>
</table>

   About what percentage of groundwater is all the other freshwater combined?
   A. 0.02%
   B. 0.2%
   C. 2.0%
   D. 20.0%
4. The picture below shows a view of the layers of the geosphere.

About how thick is Earth's mantle?

A. 40 km
B. 2,900 km
C. 3,500 km
D. 6,440 km

5. The pie chart below shows the gases that make up the air we breathe.

About how many times more nitrogen is there in the air than oxygen?

A. about 2 times more
B. about 4 times more
C. about 5 times more
D. about 6 times more

6. When trees die, they often fall on the ground and decompose. Which part of the Earth system includes dead and decomposed trees?

A. biosphere
B. geosphere
C. atmosphere
D. hydrosphere

7. The graph below shows the composition of air.

Which two gases represent the smallest parts of the composition of air?

A. oxygen and nitrogen
B. water vapor and oxygen
C. carbon dioxide and oxygen
D. water vapor and carbon dioxide
8. Leanne created the following diagram to show the process that warms the air above a lake. She decided to label each step with the energy transfer that is happening.

Which step should Leanne label conduction?

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

9. If a warm wind passes over snow, the snow can be heated rapidly. When this happens, the snow can change directly into water vapor without first becoming liquid water. What is the correct term for this process?

A. deposition
B. evaporation
C. melting
D. sublimation

10. Florida beaches are known for their white sand, clear ocean water, and palm trees. A picture of a Florida beach is shown below.

Which elements seen would be adding water vapor to the atmosphere?

A. palm trees only
B. ocean water only
C. ocean water and sand
D. palm trees, ocean water, and sand
11. Whether you live in a tropical climate, a temperate climate, or a polar climate, you share something with the rest of the world—your climate is influenced by the latitude where you live. Which best describes why latitudes closer to the equator have warmer climates?

A. Latitudes closer to the equator are at lower elevations than latitudes away from the equator.
B. Latitudes closer to the equator receive more solar energy than latitudes away from the equator.
C. Latitudes closer to the equator are nearer to ocean currents than latitudes away from the equator.
D. Latitudes closer to the equator get more wind carrying energy in the form of heat than latitudes away from the equator.

12. For several days, the weather where Cheyenne lives was cool. When the temperature did warm, Cheyenne noticed that it was also very windy. How could winds influence the temperature?

A. Winds carry energy in the form of heat around Earth.
B. Winds are caused by the energy of the sun.
C. Winds move because of differential heating.
D. Winds transfer energy in the form of heat from the air to the ground.

13. The arrows on the globe point to different latitudes and longitudes.

[Image of a globe with arrows]

Which arrow points to the area on Earth you would expect to be coldest based on its latitude?

A. R
B. S
C. T
D. W

14. Leah is going for a swim at the beach. She notices that the sand is much warmer than the water in the ocean. Which statement best explains why this happens?

A. Water is unable to absorb energy.
B. Water is unable to release energy.
C. Water has a lower specific heat capacity than sand.
D. Water has a higher specific heat capacity than sand.

15. Light from the sun heats Earth’s atmosphere. When the air becomes warmer, it expands. Which type of energy increases to cause this expansion?

A. chemical
B. electrical
C. kinetic
D. potential
16. Joseph made a poster for his Earth science project. He included the following diagram to show how Earth's surface receives solar energy.

Which process is involved when solar energy warms the surface of Earth?

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

17. Meggie measures the wind speed every day for 7 weeks. She constructs the following line graph of the average daily wind speed.

How many of the 7 weeks experience average wind speeds greater than 7.9 km/h?

A. 4 weeks  
B. 5 weeks  
C. 6 weeks  
D. 7 weeks

18. The following figure shows a valley between two mountains. The arrows indicate direction of air movement.

Which type of breeze is illustrated in the figure?

A. a sea breeze  
B. a land breeze  
C. a valley breeze  
D. a mountain breeze
19. Air rising and sinking in Earth’s atmosphere forms a pattern of smaller convection cells. These convection cells create both high- and low-pressure belts. Where in the preceding diagram are the high-pressure belts located?

A. A, B, C, D
B. A, C, E, G
C. D, E, F, G
D. B, C, D, E, F

20. Air rising and sinking in Earth’s atmosphere forms a pattern of smaller convection cells. These convection cells create both high- and low-pressure belts. Where in the preceding diagram are the low-pressure belts located?

A. A, D, G
B. B, D, F
C. C, D, E
D. D, E, F, G

21. Donnie created a model to investigate what happens to icebergs in water. He placed an ice cube in a tray of water, as shown in the following illustration. Donnie observed that the ice cube slowly melted.

What can Donnie conclude from this observation?

A. The water has a lower temperature than the ice cube.
B. The water has a higher temperature than the ice cube.
C. The water has a lower specific heat capacity than the ice cube.
D. The water has a higher specific heat capacity than the ice cube.
22. Kumar is studying how plant growth is affected by the temperature of the soil. The following picture shows his experiment.

Which of the following processes is **mainly** responsible for warming the soil?

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

23. The temperatures in Gainesville, Florida, vary more than the temperatures in Miami, Florida. The map shows the locations of both of these cities.

How can the locations of the two cities explain the differences in their temperature ranges?

A. Gainesville is farther north than Miami, so latitude will make its temperatures vary more widely.  
B. Miami is closer to the ocean, and winds from the ocean cause its temperatures to vary greatly.  
C. Miami is closer to the ocean, which affects its climate by keeping its temperatures more consistent.  
D. Gainesville is further inland, which affects its climate by keeping it warmer at night and colder during the day.

24. The following table shows the temperature and precipitation levels of four different cities on the same day. In only one city on this day, it snowed.

<table>
<thead>
<tr>
<th></th>
<th>City A</th>
<th>City B</th>
<th>City C</th>
<th>City D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Temperature</strong> (°C)</td>
<td>15</td>
<td>19</td>
<td>−9</td>
<td>−11</td>
</tr>
<tr>
<td><strong>High Temperature</strong> (°C)</td>
<td>22</td>
<td>26</td>
<td>−3</td>
<td>−5</td>
</tr>
<tr>
<td><strong>Precipitation</strong> (mm)</td>
<td>14</td>
<td>11</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

Which city experienced snow on this day?

A. City A  
B. City B  
C. City C  
D. City D

25. During a winter storm, Annabelle observes hail falling in her yard. After the hailstorm, rain falls. Which of these statements correctly describes hail and rain?

A. Hail and rain are both solids.  
B. Hail and rain are both liquids.  
C. Hail is a liquid, and rain is a solid.  
D. Hail is a solid, and rain is a liquid.
26. Zuri is a meteorologist. She is using a barometer. What feature of weather is Zuri studying?
   A. humidity  
   B. wind speed  
   C. temperature  
   D. air pressure

27. A deep ocean current forms when ocean water becomes denser and sinks. The following figure shows a major global deep ocean current.

Based on the illustration, which of the following statements describes the relationship between density and temperature?
   A. Cold water is denser than warm water.  
   B. Warm water is denser than cold water.  
   C. Warm and cold water have equal densities.  
   D. The density of water is not affected by temperature.

28. Donnie makes flash cards for the vocabulary in the chapter on ocean currents. For Coriolis effect, he writes the following definition: the curving of the path of a moving object from a straight path.

   What important information did Donnie forget in his definition?
   A. due to wind  
   B. due to Earth’s rotation  
   C. due to the sun’s energy  
   D. due to continental deflection

29. Eliana measures the outdoor temperature each day for a week at exactly 3:00 p.m. The temperatures she records are all between 25 °C and 30 °C. Eliana concludes that the climate of her area is tropical. What is the most important reason why her study and conclusion may not be correct?
   A. She recorded the temperature at only one time of day instead of more often.  
   B. She made her conclusion based only on temperature and not also on precipitation.  
   C. She made her conclusion based on only 1 week of data instead of over a long period of time.  
   D. She did not calculate the humidity, air pressure, and wind conditions when she made her conclusion.

30. Aurora records the following observations: It rained on Monday. It was sunny on Tuesday. It rained again on Wednesday. What is Aurora recording?
   A. observations of the weather  
   B. observations of the climate  
   C. observations of both weather and climate  
   D. observations of neither weather or climate
31. The gases that make up Earth’s atmosphere are commonly referred to as air. Air consists of major gases and trace gases. What are the two most abundant gases in the atmosphere?
   A. nitrogen and oxygen
   B. water vapor and argon
   C. oxygen and carbon dioxide
   D. nitrogen and carbon dioxide

32. The layer of gases that surrounds Earth is called the atmosphere. The atmosphere is tied to Earth by gravitation, so that it cannot disperse into space. Refer to the following circle graph.

   The graph shows the relative abundance of gases in Earth's atmosphere. Which gas(es) correspond(s) to label C in the figure?
   A. oxygen
   B. nitrogen
   C. argon and carbon dioxide
   D. oxygen and carbon dioxide
Nature of Science (NOS)

SC.6.N.1.1 Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.6.N.1.2 Explain why scientific investigations should be

SC.6.N.1.3 Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.

SC.6.N.1.4 Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

SC.6.N.2.2 Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

SC.6.N.3.1 Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Medical students use a three-dimensional reproduction of a human skeleton to learn about bones. Which item describes this learning tool?
   
   A. an x-ray  
   B. a visual model  
   C. a computer model  
   D. a mathematical representation

2. The following weather map shows current conditions in the area. Ten hours later, the operator inputs new weather data into the computer. These data differ from the earlier data, which produced this map.

   As a result of the new weather data, what will happen to the map?
   
   A. The map will remain unchanged.  
   B. The map will change to reflect the new data.  
   C. The map will show new weather patterns in Europe.  
   D. The map will predict all characteristics of a weather pattern.
3. The diagram shows Niels Bohr’s theory about how electrons are arranged in atoms. He thought electrons traveled on specific paths around a nucleus. The current theory is that electrons exist in certain cloudlike regions around a nucleus.

How would a model of the current theory differ from Bohr’s model?

A. It would be the same as Bohr’s model.
B. Object A would differ from Bohr’s model.
C. Object B would differ from Bohr’s model.
D. Both objects A and B would differ from Bohr’s model.

4. The theory of evolution describes how organisms change over time. Scientists now use information in the DNA of living organisms to understand how they are related. The theory of evolution was developed before scientists discovered DNA; however, the theory supports these new data. What does this sequence of events tell us about the theory of evolution?

A. It is a bad theory because it makes scientists biased.
B. It is a good theory because it has changed greatly over time.
C. It is a good theory because it is able to explain new evidence.
D. It is a bad theory because it was formed before the discovery of DNA.

5. The table shows events that led to the current theory that the sun is the center of the solar system.

<table>
<thead>
<tr>
<th>Event</th>
<th>Event Description</th>
<th>Which sequence of events is correct?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scientists observe planetary motion that cannot be explained if Earth is the center of the universe.</td>
<td>A. 1, 2, 3</td>
</tr>
<tr>
<td>2</td>
<td>Scientists accept the theory that the planets and sun travel around Earth.</td>
<td>B. 1, 3, 2</td>
</tr>
<tr>
<td>3</td>
<td>Scientists develop the theory that the planets travel around the sun.</td>
<td>C. 2, 1, 3</td>
</tr>
</tbody>
</table>

D. 3, 1, 2
6. The following graphs show how the amount of carbon dioxide in the atmosphere has changed over time.

How might a researcher label graph 2?

A. unreliable source
B. reliable source
C. matches theory
D. does not match theory

7. Which statement defines a good scientific theory?

A. It becomes a law.
B. It describes many relationships.
C. It is widely accepted by nonscientists.
D. It can be changed to fit new observations.

8. The table shows how the theory of atoms has changed over time.

<table>
<thead>
<tr>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

What do these changes show about the current theory of the atom?

A. It is bad because it is likely to change again.
B. It is good because it is from a reliable source.
C. It is good because it adapts to include new information.
D. It is bad because it does not match the original theory of the atom.
9. Which source should a scientific researcher reject because of unreliability?

A. textbook
B. government brochure
C. webpage of a university professor
D. advertisement promoting a product

10. The table shows data on how the population of butterflies in a backyard changes over five days.

<table>
<thead>
<tr>
<th>Day</th>
<th>Number of butterflies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

Which mathematical model accurately predicts how many butterflies there will be on Day 6?

A. Number of butterflies = 3 + 3
B. Number of butterflies = 15 + 3
C. Number of butterflies = 3´3
D. Number of butterflies = 15´3

11. Many substances can be dissolved in water. The maximum amount of a substance that can be dissolved in a solvent is called solubility. The solubility of a substance often changes with the temperature of the water. The graph shows the solubility of NaNO₃ (sodium nitrate) and HCl (hydrochloric acid).

Which statement best summarizes the data shown in the graph?

A. The solubility of both substances increases as the temperature increases.
B. The solubility of both substances decreases as the temperature increases.
C. The solubility of HCl increases as the temperature of the water increases.
D. The solubility of NaNO₃ increases as the temperature of the water increases.
12. Mackenzie investigates how the volume of gas inside a balloon changes as the temperature of the gas changes. She moves an inflated, sealed balloon from a freezer to a sunny window. Which experimental variable does she change?

A. the type of balloon  
B. the temperature of the gas  
C. the type of gas inside the balloon  
D. the amount of gas inside the balloon

13. Lee wants to make sure she understands the components of a good scientific investigation. She knows that it should be controlled and have a large sample size. Also, she thinks that the results should be communicated to other scientists. Which is another component that is necessary for a good investigation?

A. It must be conducted in a big lab.  
B. It must be run by a university scientist.  
C. It must be done with expensive equipment.  
D. It must be able to be replicated by other scientists.

14. Which practice greatly limits the value of experimental findings?

A. having the findings published  
B. basing the findings on a large amount of data  
C. having the findings reviewed by a panel of peers  
D. using an experimental procedure that cannot be reproduced

15. Gemma wants to investigate the rain forest ecosystem of the Amazon jungle in South America. To conduct the experiment, Gemma uses plants, reptiles, and insects native to New Jersey, where she lives, to build a terrarium such as the one shown in the following figure.

Which limitation is true of Gemma’s experiment?

A. It does not model the interaction of certain insects and plants.  
B. It does not model the interaction of certain reptiles and plants.  
C. It does not model the interaction of certain reptiles and insects.  
D. It does not model the exact conditions of nature in the Amazon.
16. Anton is a geologist. He wants to get the best possible information about lava flows from eruptions that are happening at some specific locations around the world. He wants to be able to vary what he studies based on his initial findings. Which type of investigation should Anton conduct?

A. a survey  
B. fieldwork  
C. library research  
D. a laboratory investigation

17. Three different lab groups perform experiments to determine the density of the samples of iron. They have all rounded the density to the nearest whole number.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mass of iron (g)</th>
<th>Volume of iron (cm³)</th>
<th>Density of iron (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>?</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

What is the mass of iron for group 3?

A. 5 g  
B. 8 g  
C. 40 g  
D. 64 g

18. The result of an experiment about how the speed of an object changes over time is shown in the following graph.

Based on this graph, four different lab groups came to the following conclusions. Which group’s conclusion describes the result shown in the graph?

A. Group 1: The speed of the object increases as time passes.  
B. Group 2: The speed of the object decreases as time passes.  
C. Group 3: The speed of the object does not change as time passes.  
D. Group 4: The speed of the object decreases, then increases as time passes.

19. Joe tells Mai his theory about why sea turtles nest on the beach instead of in the ocean. He says, “The turtle eggs would sink to the bottom of the ocean, and the baby turtles would drown.” Joe says his uncle is a fisherman, who told Joe this information. Mai tells Joe that his theory is not scientific. Which explanation supports Mai’s evaluation of Joe’s theory?

A. Joe’s idea is already a scientific law.  
B. Joe’s idea is not supported by scientific evidence.  
C. Joe’s idea is a good guess that can be tested by experiments.  
D. Joe’s idea accurately explains why sea turtles nest on the beach.
20. Which statement belongs in a scientific theory about how hurricanes form?

A. Hurricanes get bigger over warm water.
B. The eye is the calmest part of the storm.
C. Hurricanes have wind speeds greater than 119 km/h.
D. Rotating thunderstorms gain energy over warm tropical waters.

21. Although a scientific theory is well supported and widely accepted, what might cause it to change?

A. new evidence
B. a scientific law
C. individual claims
D. a scientific model

22. The following graph shows the results of an experiment done by four different groups. Each group took a different rubber band and recorded how far it stretched as they added weights to it.

Which group’s rubber band stretched the least as more weight was added?

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

23. Which sequence of events describes the standard scientific method of investigation?

A. experiment --> hypothesis --> analysis of data --> conclusion
B. hypothesis --> experiment --> conclusion --> analysis of data
C. analysis of data --> conclusion --> experiment --> hypothesis
D. hypothesis --> experiment --> analysis of data --> conclusion

24. A good experiment has several characteristics. Which characteristic is part of a scientifically sound experiment?

A. Results can be reproduced.
B. Results are not reviewed by peers.
C. Results are based on a small sample size.
D. Results are based on an undisclosed process or procedure.
25. The periodic table organizes the known elements into rows and columns.

Which element is located in row 5, column IIIIB?

A. V  
B. Y  
C. Ca  
D. Sc