2021 STAAR Grade 8 Science Rationales

| Item# | Rationale | |
|---|---|---|
| 1 | Option A is correct | A biotic factor is a living part of an ecosystem. Primary consumers obtain energy by consuming plants. Plants are living, so plants are considered biotic. |
| | Option B is incorrect | Space is not a living part of the ecosystem. Space is an abiotic factor. |
| | Option C is incorrect | Oxygen is not a living part of the ecosystem. Oxygen is an abiotic factor. |
| | Option D is incorrect | Sunlight is not a living part of the ecosystem. Sunlight is an abiotic factor. |

Texas Education Agency
Student Assessment Division
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| Item# | Rationale | |
|---|---|---|
| 2 | Option H is correct | Inertia is the tendency of an object to resist changes in its motion. Inertia causes the ball to continue moving in the same direction and at the same speed. |
| | Option F is incorrect | Friction is a force that acts in the opposite direction of the motion and will cause changes in speed and/or direction. Friction would cause the ball to slow down, not to continue rolling forward at the same speed. |
| | Option G is incorrect | Friction would cause the ball to slow down, not roll forward at an increasing speed. |
| | Option J is incorrect | Inertia causes the ball to continue the motion it had already, not to increase in speed. |

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| Item# | Rationale | |
|---|---|---|
| 3 | Option D is correct | A chemical reaction results in the formation of a new substance with different properties. The two liquids formed small, solid particles, which are a new substance. This is evidence that a chemical reaction occurred. |
| | Option A is incorrect | A change in shape is not evidence that a chemical reaction occurred, but it can be evidence that a physical change occurred. |
| | Option B is incorrect | A change in volume is not evidence that a chemical reaction occurred, but it can be evidence that a physical change occurred. |
| | Option C is incorrect | Two liquids mixing into a solution is not evidence that a chemical change occurred, but it can be evidence that a physical change occurred. |

| Item# | Rationale | |
|---|---|---|
| 4 | Option G is correct | The tilt of Earth's axis causes the seasons because of the angle at which the sunlight strikes Earth's surface. When a pole is tilted toward the sun, there is more direct sunlight on that hemisphere, causing the higher temperatures of summer. In the diagram, it is summer in the Northern Hemisphere and winter in the Southern Hemisphere. |
| | Option F is incorrect | The months of the year are the same, regardless of the season each hemisphere is experiencing. If it is August in the Northern Hemisphere, it would also be August in the Southern Hemisphere. |
| | Option H is incorrect | The number of hours of daylight and darkness is determined by how directly sunlight is striking Earth. When a location is tilted away from the sun, that location receives fewer hours of daylight than it does when it is tilted toward the sun. The number of hours of daylight is less, not greater, in the Southern Hemisphere than in the Northern Hemisphere because the Southern Hemisphere is tilted away from the sun. |
| | Option J is incorrect | The seasons of the year are opposite from one hemisphere to another. In the Northern Hemisphere, spring begins in March, but in the Southern Hemisphere, spring begins in September. |

| Item# | Rationale | |
|---|---|---|
| 5 | Option C is correct | Pollution resulted in the death of many algae. Because *Daphnia* consume algae, the population of *Daphnia* would decrease after the pollution event. Because the pollution event killed many algae but not all, the *Daphnia* population would recover once the algae population increased. |
| | Option A is incorrect | This graph shows an increase in the *Daphnia* population after the pollution event. The pollution event resulted in the death of many algae. This means that the population decreased after the pollution event. |
| | Option B is incorrect | Because the pollution event killed many algae, but not all of them, the *Daphnia* population would recover once the algae population did. |
| | Option D is incorrect | This graph shows that the *Daphnia* population decreased, but the population did not recover. |

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| Item# | Rationale | |
|---|---|---|
| 6 | Option F is correct | The value 1.3 $m/s^2$ was obtained by rearranging the formula Force = mass × acceleration to solve for acceleration.<br>$a = F/m = 67\ N/\ 51.5\ kg = 1.3\ m/s^2$ |
| | Option G is incorrect | The value 3,425.05 is obtained by multiplying mass and force. |
| | Option H is incorrect | The value 15.5 is obtained by subtracting mass from force. |
| | Option J is incorrect | The value 0.77 is obtained by dividing mass from force. |

| Item# | Rationale | |
|---|---|---|
| 7 | Option D is correct | The spacing of the contour lines shows how steep or gentle the slope of the surface is. Contour lines that are close together represent a steep slope. Contour lines that are far apart represent a gentle slope. The contour lines are close together and then become farther apart as the park ranger travels west from the radio tower. |
| | Option A is incorrect | Contour lines crossing a river are bent to form a V that points upstream. Since a river would flow downhill from the peak and the contour lines are not bent to point up the hill, there is no river present. |
| | Option B is incorrect | A peak is represented by contour lines arranged in a circle. There are no peaks to the west of the radio tower. |
| | Option C is incorrect | A flat path is represented by contour lines that are far apart. A steep slope is represented by lines that are close together. |

| Item# | Rationale | |
|---|---|---|
| 8 | Option F is correct | Fluorine and chlorine are nonmetals that are gases at room temperature. |
| | Option G is incorrect | Boron is a metalloid, and aluminum is a metal. |
| | Option H is incorrect | Hydrogen is a nonmetal gas at room temperature, but cesium is a metal that is a solid at room temperature. |
| | Option J is incorrect | Cobalt and nickel are metals. |

| Item# | Rationale | |
|---|---|---|
| 9 | Option C is correct | Sustainability of an ecosystem comes from having high species diversity within the ecosystem. Having a greater diversity of living organisms in the pond would increase the biodiversity. If the biodiversity of the pond is increased, the sustainability of the pond would increase. |
| | Option A is incorrect | The pond's sustainability would not increase because decreasing the number of plant species anywhere in the pond leads to a decrease in biodiversity. |
| | Option B is incorrect | Introducing older fish of the same species would not increase the sustainability of the pond because the biodiversity is not increased. |
| | Option D is incorrect | Adding gravel anywhere in the pond would not increase the pond's sustainability because the biodiversity is not increased. |

| Item# | Rationale | |
|---|---|---|
| 10 | Option F is correct | The slope (distance/time) of a distance vs. time graph represents the speed of the object. The graph shows a constant slope, which means the speed is constant. |
| | Option G is incorrect | Acceleration refers to a change in speed or direction. The speed is not changing because the slope of the graph is not changing in the first 30 seconds of the investigation. |
| | Option H is incorrect | The graph shows a constant slope between 0 and 30 seconds, not an increasing slope. |
| | Option J is incorrect | The acceleration of the vehicle is not changing. Because the speed is constant, there is no acceleration. |

| Item# | | Rationale |
|---|---|---|
| 11 | 20 and any equivalent values are correct | The mass number represents the number of protons and neutrons in the nucleus of an atom. The atomic number represents the number of protons in an atom. The mass number for potassium is 39. The atomic number for potassium is 19. To obtain the number of neutrons in the nucleus of an atom, subtract the atomic number from the mass number.<br>Mass number – atomic number = number of neutrons.<br>39 protons and neutrons – 19 protons = 20 neutrons. |

| Item# | Rationale | |
|---|---|---|
| 12 | Option H is correct | Oceans are heated by the sun's energy. Ocean currents transport warm water from the equator toward the poles and cold water from the poles back to the tropics. |
| | Option F is incorrect | Ocean currents do not control tides. The gravitational pull of the moon on Earth regulates tides. |
| | Option G is incorrect | Ocean currents do not trap heat to control the global climate. Ocean currents distribute heat. |
| | Option J is incorrect | Ocean currents do not choose to travel to areas experiencing drought. |

| Item# | Rationale | |
|---|---|---|
| 13 | Option D is correct | Plant cells use chloroplasts to obtain energy to produce their own food. |
| | Option A is incorrect | Both plant and animal cells store nutrients in vacuoles. |
| | Option B is incorrect | Both plant and animal cells contain genetic information in a nucleus. |
| | Option C is incorrect | Both plant and animal cells allow water to enter and exit the cell through the cell membrane. |

| Item# | Rationale | |
|---|---|---|
| 14 | Option F is correct | Both metals and nonmetals are able to transfer thermal energy; the difference is in the speed of transfer and the degree to which the transfer occurs. |
| | Option G is incorrect | Nonmetals tend to be dull and brittle. Metals tend to be shiny and malleable. |
| | Option H is incorrect | Metals tend to be good conductors of electricity. |
| | Option J is incorrect | In general, metals can be stretched into thin wires. In general, nonmetals cannot be stretched into thin wires. |

| Item# | Rationale | |
|---|---|---|
| 15 | Option C is correct | The amount of kinetic energy an object has depends on its motion and speed. The amount of potential energy an object has depends on its position. As the cart of a roller coaster approaches the highest point, its potential energy increases because it is getting higher above the earth, but its kinetic energy is decreasing because it slows down as it goes up the hill. |
| | Option A is incorrect | The cart loses kinetic energy and gains potential energy. |
| | Option B is incorrect | The cart loses kinetic energy and gains potential energy. |
| | Option D is incorrect | The cart loses kinetic energy and gains potential energy. |

| Item# | Rationale | |
|---|---|---|
| 16 | Option G is correct | On May 18 there will be a new moon. A new moon would be visible approximately 5–7 days after a last quarter moon. |
| | Option F is incorrect | On May 13 there will still be a last quarter moon. Moon phases last about 3–4 days each. |
| | Option H is incorrect | On May 25 there will be a first quarter moon. A first quarter moon follows a new moon. |
| | Option J is incorrect | On May 31 there will be a full moon. A full moon is visible after a first quarter moon. |

| Item# | Rationale | |
|---|---|---|
| 17 | Option C is correct | The subscript 3 on the symbol for hydrogen, H, indicates that there are 3 hydrogen atoms. There is no subscript on the symbol for phosphorus, P, so this indicates that there is 1 phosphorus atom. The subscript 4 on the symbol for oxygen, O, indicates that there are 4 oxygen atoms. The total number of atoms in phosphoric acid = 3 hydrogen atoms + 1 phosphorus atom + 4 oxygen atoms = 8 total atoms. |
| | Option A is incorrect | The subscript 2 on the symbol for hydrogen, H, indicates that there are 2 hydrogen atoms. There is no subscript on the symbol for carbon, C, so this indicates that there is 1 carbon atom. The subscript 3 on the symbol for oxygen, O, indicates that there are 3 oxygen atoms. The total number of atoms in carbonic acid = 2 hydrogen atoms + 1 carbon atom + 3 oxygen atoms = 7 total atoms. |
| | Option B is incorrect | There is no subscript on the symbol for hydrogen, H, so this indicates that there is 1 hydrogen atom. There is no subscript on the symbol for nitrogen, N, so this indicates that there is 1 nitrogen atom. The subscript 3 on the symbol for oxygen, O, indicates that there are 3 oxygen atoms. The total number of atoms in nitric acid = 1 hydrogen atom + 1 nitrogen atom + 3 oxygen atoms = 5 total atoms. |
| | Option D is incorrect | The subscript 2 on the symbol for hydrogen, H, indicates that there are 2 hydrogen atoms. There is no subscript on the symbol for sulfur, S, so this indicates that there is 1 sulfur atom. The subscript 4 on the symbol for oxygen, O, indicates that there are 4 oxygen atoms. The total number of atoms in sulfuric acid = 2 hydrogen atoms + 1 sulfur atom + 4 oxygen atoms = 7 total atoms. |

| Item# | Rationale | |
|---|---|---|
| 18 | Option H is correct | Earth’s gravity is the attractive force that causes the moon to remain in orbit around Earth. |
| | Option F is incorrect | Earth’s rotation is not an attractive force. Therefore, Earth’s rotation cannot cause the moon to remain in orbit around Earth. |
| | Option G is incorrect | The moon’s rotation is not an attractive force. Therefore, the moon’s rotation cannot cause the moon to remain in orbit around Earth. |
| | Option J is incorrect | The sun’s gravity is an attractive force. The sun’s gravity keeps the Earth in orbit around the sun, not the moon around Earth. |

| Item# | Rationale | |
|---|---|---|
| 19 | Option D is correct | Species Z has short, mostly horizontal roots. Short roots absorb water near the soil surface. Species Y has long, mostly vertical roots. Long roots absorb water deep underground. |
| | Option A is incorrect | Species Z does not absorb water deep underground because Species Z has short, mostly horizontal roots. Short roots absorb water near the soil surface. Species X absorbs water mostly deep underground because Species X has long, mostly vertical roots. |
| | Option B is incorrect | Species Z does not absorb water deep underground because Species Z has short, mostly horizontal roots. |
| | Option C is incorrect | Species Y absorbs water mostly deep underground because Species Y has long, mostly vertical roots. |

| Item# | Rationale | |
|---|---|---|
| 20 | Option H is correct | Because 20N is greater than 15N, the net force of 5N will cause the duck to move to the right. |
| | Option F is incorrect | The duck will not stop moving because the duck exerts a net force of 5N to the right. |
| | Option G is incorrect | The duck will not stop moving because the duck exerts a net force of 5N to the right. |
| | Option J is incorrect | The water is exerting 15 newtons of resistive force against the duck. 20 newtons is greater than 15 newtons, so the duck will move in the direction of the 20N force. |

| Item# | Rationale | |
|---|---|---|
| 21 | Option B is correct | The density of the unknown metal was obtained using the equation Density = mass/volume. D = 25.0 g/3.19 $cm^3$ = 7.83 $g/cm^3$. The density of iron is 7.85 $g/cm^3$. This value is the closest to the density value for the unknown metal. Therefore, the unknown metal is most likely iron. |
| | Option A is incorrect | The density of gold is 19.30 $g/cm^3$. Since the density of the unknown metal is 7.83 $g/cm^3$, the unknown metal is not gold. |
| | Option C is incorrect | The density of silver is 10.50 $g/cm^3$. Since the density of the unknown metal is 7.83 $g/cm^3$, the unknown metal is not silver. |
| | Option D is incorrect | The density for tin is 7.28 $g/cm^3$. Since the density of the unknown metal is 7.83 $g/cm^3$, the unknown metal is not tin. |

| Item# | Rationale | |
|---|---|---|
| 22 | Option J is correct | Stars that emit most of their visible light at wavelengths that are near blue light are the hottest. Stars with the shortest wavelength are the hottest stars. |
| | Option F is incorrect | Stars that emit most of their visible light at this wavelength are not as hot as stars with a shorter wavelength. |
| | Option G is incorrect | Stars that emit most of their visible light at this wavelength are not as hot as stars with a shorter wavelength. |
| | Option H is incorrect | Stars that emit most of their visible light at this wavelength are not as hot as stars with a shorter wavelength. |

| Item# | Rationale | |
|---|---|---|
| 23 | Option B is correct | Larger beaks will be needed to crack open the larger seeds. Birds with smaller beaks will not be able to access the food from the larger seeds. |
| | Option A is incorrect | A change in the availability of a type of seed will not affect how much food a bird requires. |
| | Option C is incorrect | Birds with a small beak depth will not have an advantage over birds with a large beak depth because larger beaks are needed to crack open larger seeds. |
| | Option D is incorrect | Birds with a large beak depth will have an advantage because larger beaks are needed to crack open larger seeds. |

| Item# | Rationale | |
|---|---|---|
| 24 | Option H is correct | Chemical energy is energy stored in chemical bonds. Batteries store chemical energy that can be transformed into electrical energy. Electrical energy is the energy of moving electrons. Mechanical energy is the energy an object has due to its motion (kinetic energy) or its position (potential energy). Mechanical energy is used to spin the blades of the fan. |
| | Option F is incorrect | Mechanical energy is not being converted to electrical energy as the blades spin. On the contrary, electrical energy is being converted to mechanical energy as the blades begin to spin. |
| | Option G is incorrect | Electrical energy is not being converted to chemical energy. Instead, chemical energy is converted to electrical energy, which causes the blades to spin. |
| | Option J is incorrect | Mechanical energy is not being converted to electrical energy, and electrical energy is not being converted to chemical energy. This order is reversed. |

| Item# | Rationale | |
|---|---|---|
| 25 | Option D is correct | A chemical change results in the formation of a new substance with different chemical properties. A physical change does not form substances with different chemical properties. Although the outward appearance of a substance is changed, the chemical composition remains unchanged. Water evaporating from salt water does not form substances with different chemical properties and is therefore a physical change. |
| | Option A is incorrect | Fungus decomposing organic matter results in a new substance and is therefore a chemical change. |
| | Option B is incorrect | Leaves using carbon dioxide to make sugar results in a new substance and is therefore a chemical change. |
| | Option C is incorrect | Plants using nitrogen to make protein results in a new substance and is therefore a chemical change. |

| Item# | Rationale | |
|---|---|---|
| 26 | Option H is correct | Bowman's root has these characteristics:<br>1b. Flower has five petals.<br>2b. Petals appear smooth, in a single piece.<br>3a. Petals are very long, narrow, and pointed. |
| | Option F is incorrect | Starflower does not have these characteristics:<br>1b. Flower has five petals.<br>2b. Petals appear smooth, in a single piece.<br>3a. Petals are very long, narrow, and pointed. |
| | Option G is incorrect | Chickweed does not have these characteristics:<br>2b. Petals appear smooth, in a single piece. |
| | Option J is incorrect | Common strawberry does not have these characteristics:<br>3a. Petals are very long, narrow, and pointed. |

| Item# | Rationale | |
|---|---|---|
| 27 | Option B is correct | The stars in section 2 are the coolest and brightest stars. According to the H-R diagram, the stars in section 2 have the lowest temperature values and the highest luminosity values. The stars in section two have a temperature range of $75 \times 10^2$ K to $30 \times 10^2$ K and a luminosity range of 10 to $10^6$. |
| | Option A is incorrect | The stars in section 1 are the hottest and brightest stars. The stars in section 1 have a temperature range of $400 \times 10^2$ to $75 \times 10^2$, and a luminosity range of 10 to $10^6$. |
| | Option C is incorrect | The stars in section 3 are the hottest and dimmest stars. The stars in section 3 have a temperature range of 400 x 102 to $75 \times 10^2$, and a luminosity range of $10^{-4}$ to 10. |
| | Option D is incorrect | The stars in section 4 are the coolest and dimmest stars. The stars in section 3 have a temperature range of $75 \times 10^2$ K to $30 \times 10^2$ K and a luminosity range of $10^{-4}$ to 100. |

| Item# | Rationale | |
|---|---|---|
| 28 | Option F is correct | When two objects interact with each other, those two objects are exerting forces upon each other. The forces that the interacting objects exert on each other are called action and reaction forces. The action force is the force applied by the first object (the skater) on the second object (the wall). The reaction force is the force applied by the second object (the wall) on the first object (the skater). Action-reaction pairs are equal yet opposite in direction. |
| | Option G is incorrect | This interaction is not an action-reaction pair. This interaction is an example of friction. Friction would cause the wheels to slow down, which, in turn, causes the skater to eventually stop. |
| | Option H is incorrect | This interaction is not an action-reaction pair. An action-reaction pair occurs between two objects. An example of an action-reaction pair is the wheels exerting a force on the floor and the floor exerting a force on the wheels. |
| | Option J is incorrect | This interaction is not an action-reaction pair. Friction contributes to changes in acceleration and velocity. |

| Item# | Rationale | |
|---|---|---|
| 29 | Option C is correct | The arrows in a food web represent the direction of energy flow. In this food web, energy flows from acorns, insects, and nuts to fox squirrels because fox squirrels eat acorns, insects, and nuts. The energy flows from fox squirrels to bobcats, snakes, and owls because bobcats, snakes, and owls are predators of fox squirrels. |
| | Option A is incorrect | The energy does not flow from fox squirrels to acorns and nuts because acorns and nuts do not eat fox squirrels. Instead, the energy flows from acorns and nuts to fox squirrels because fox squirrels eat acorns and nuts. |
| | Option B is incorrect | The energy does not flow from fox squirrels to acorns and nuts because acorns and nuts do not eat fox squirrels. Instead, the energy flows from acorns and nuts to fox squirrels because fox squirrels eat acorns and nuts. The energy does not flow from the bobcats, snakes, and owls to fox squirrels because fox squirrels do not eat bobcats, snakes, and owls. Instead, the energy flows from fox squirrels to bobcats, snakes, and owls because bobcats, snakes, and owls eat fox squirrels. |
| | Option D is incorrect | All the arrows are reversed. Therefore, the energy flow is reversed for all organisms in this food web. |

| Item# | Rationale | |
|---|---|---|
| 30 | Option F is correct | The human skeletal system provides structure and support for the body. The muscular system connects to the skeletal system, which allows for movement. |
| | Option G is incorrect | The nervous system transmits messages and controls body functions. The circulatory system transports nutrients and oxygen to cells throughout the body and transports carbon dioxide and waste products away from the body. |
| | Option H is incorrect | The respiratory system delivers oxygen to the cells and removes carbon dioxide from the circulatory system. The digestive system ingests food, breaks down the food, and processes the nutrients from the food. |
| | Option J is incorrect | The integumentary system protects against disease, creates a barrier against outside environments, protects internal organs, and regulates body temperature. The excretory system removes waste products from the body. |

| Item# | Rationale | |
|---|---|---|
| 31 | Option C is correct | This is an image of a new moon. A tide is the periodic rising and falling of the ocean surface. The rise and fall of the oceans are caused by the gravitational interaction between Earth, the moon, and the sun. High tides and low tides occur every day. Spring tides are when there is the biggest difference between high and low tide. During spring tides, the high tide is highest and the low tide is lowest. Spring tides occur during a new and full moon when the Earth, the moon, and the sun are aligned. The pull of the sun's gravity and the moon's gravity are in line with each other. |
| | Option A is incorrect | This is an image of a first quarter moon. The tide is very small during a first quarter moon. Neap tides occur during the first or third quarter moon. Neap tides are when the difference between high and low tides is the least. During the first and third quarter moon, the pull of the moon's gravity is at a right angle to the pull of the sun's gravity, so the tide is at its lowest. |
| | Option B is incorrect | This is an image of a waxing crescent. The tide is small during a waxing crescent. |
| | Option D is incorrect | This is an image of a third quarter moon. The tide is very small during a third quarter moon. Neap tides occur during the first or third quarter moon. Neap tides are when the difference between high and low tides is the least. During the first and third quarter moon, the pull of the moon's gravity is at a right angle to the pull of the sun's gravity, so the tide is at its lowest. |

| Item# | | Rationale |
|---|---|---|
| 32 | 0.3 and any equivalent values are correct | The average speed for each trial was obtained by using the equation *Speed = distance/time*. The units used are kilometers, km, per minute, min.<br>The average speed for Trial 1 is S = d/t = 4.5 km/15 min = 0.3 km/min.<br>The average speed for Trial 2 is S = d/t = 9.0 km/30 min = 0.3 km/min.<br>The average speed for Trial 3 is S = d/t = 13.5 km/45 min = 0.3 km/min.<br>The average speed for all trials was obtained by using the equation *Average = sum of the data/sample size*.<br>The average of the speed for all trials is<br>(0.3 km/min + 0.3 km/min + 0.3 km/min)/3 = 0.9 km/min/3 = 0.3 km/min. |

| Item# | Rationale | |
|---|---|---|
| 33 | Option D is correct | The components of the cell theory are:<br>1. All living organisms are made up of cells.<br>2. Cells are the basic unit of life.<br>3. All cells come from preexisting cells. |
| | Option A is incorrect | This is not a component of cell theory. |
| | Option B is incorrect | Many cells perform several life functions. All cells, not most, come from existing cells. |
| | Option C is incorrect | Cells are the basic unit of life for all organisms, not the basic unit of structure. |

| Item# | Rationale | |
|---|---|---|
| 34 | Option F is correct | There are no glaciers present in Africa at this time. In order for Africa to have scratches made by a glacier, Africa had to have been closer to the South Pole. |
| | Option G is incorrect | The equator is an imaginary line that divides the Northern Hemisphere and the Southern Hemisphere. The equator has not changed locations. |
| | Option H is incorrect | Volcanoes are formed when tectonic plates move away from each other or when tectonic plates collide. The formation of glaciers is not related to the formation of volcanoes. |
| | Option J is incorrect | The North Pole and the South Pole have reversed in polarity many times in Earth's history. Evidence of this is found on some rocks in the ocean floor, not in the presence of glaciers. |

| Item# | Rationale | |
|---|---|---|
| 35 | Option B is correct | Chlorine, Cl, is in Group 17. All elements in Group 17 have 7 valence electrons. Valence electrons, located in the outermost energy level of an electron cloud, determine the chemical properties of an element. Reactivity, which refers to the ability of an element to react with other elements, is a chemical property. Fluorine, F, and iodine, I, have 7 valence electrons. Because these elements have 7 valence electrons, these elements are in Group 17. Chlorine is also in Group 17; therefore, fluorine and iodine both have reactivities that are similar to chlorine. |
| | Option A is incorrect | Argon, Ar, is in Group 18. Therefore, argon has 8 valence electrons. An element with 8 valence electrons will have reactivity that is similar to other elements that have 8 valence electrons. Since chlorine has 7 valence electrons, their reactivities are not similar. |
| | Option C is incorrect | Sulfur, S, is in Group 16. Therefore, sulfur has 6 valence electrons. Bromine, Br, is in Group 2. Therefore, bromine has 2 valence electrons. Since chlorine has 7 valence electrons, its reactivity is not similar to either sulfur or bromine. |
| | Option D is incorrect | Sulfur and argon have a different number of valence electrons than chlorine has. Therefore, sulfur and argon have different reactivities than chlorine. |

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| Item# | Rationale | |
|---|---|---|
| 36 | Option J is correct | Leaves with the greatest amount of surface area allow for the greatest amount of sunlight to be absorbed. |
| | Option F is incorrect | Leaves that are needle-shaped have a small amount of surface area. A leaf with a small amount of surface area cannot absorb as much sunlight as a leaf with a large amount of surface area. |
| | Option G is incorrect | Leaves that are the smallest have a small amount of surface area. A leaf with a small amount of surface area cannot absorb as much sunlight as a leaf with a large amount of surface area. |
| | Option H is incorrect | Leaves that store the greatest amount of water do not necessarily allow the plant to compete for sunlight. A large surface area is needed for the leaf to compete for sunlight. |

| Item# | Rationale | |
|---|---|---|
| 37 | Option C is correct | According to the law of conservation of mass, mass is not created or destroyed in a chemical reaction. The total mass is conserved, which means that the amount of mass remains the same before and after a chemical reaction occurs. |
| | Option A is incorrect | The mass will not increase. The mass will remain the same before and after the chemical reaction occurs. |
| | Option B is incorrect | The mass will not decrease. The mass will remain the same before and after the chemical reaction occurs. |
| | Option D is incorrect | The mass will not decrease nor increase. The mass will remain the same before and after the chemical reaction occurs. |

| Item# | Rationale | |
|---|---|---|
| 38 | Option J is correct | Earth rotates on its axis, an imaginary line running through the center of Earth from the North Pole to the South Pole. This causes day and night because different parts of Earth are illuminated by the sun while Earth rotates. |
| | Option F is incorrect | The sun does not stop sending light to Earth at night. |
| | Option G is incorrect | Earth does not move farther away from the sun at night. |
| | Option H is incorrect | The tilt of Earth causes less light to reach Earth all the time the Earth is tilted away from the sun, not just at night. |

| Item# | Rationale | |
|---|---|---|
| 39 | Option B is correct | There are two primary forces acting on the toy truck. The primary forces acting on the toy truck are the toy truck's weight due to gravity and the force of the floor on the toy truck. Both of these forces are balanced. As a result, the truck is at rest, or motionless. |
| | Option A is incorrect | When the forces are balanced, no motion occurs. |
| | Option C is incorrect | When the forces are unbalanced, motion occurs. |
| | Option D is incorrect | The truck is at rest, so it is motionless. It is motionless because the forces are balanced. |

| Item# | Rationale | |
|---|---|---|
| 40 | Option F is correct | Copper is a metal. Metals are generally good conductors of electricity. Gold is also a metal, so gold is also generally a good conductor of electricity. |
| | Option G is incorrect | Radon is a nonmetal. Nonmetals generally do not conduct electricity. |
| | Option H is incorrect | Bromine is a nonmetal. Nonmetals generally do not conduct electricity. |
| | Option J is incorrect | Nitrogen is a nonmetal. Nonmetals generally do not conduct electricity. |

| Item# | Rationale | |
|---|---|---|
| 41 | Option B is correct | Since temperature changes are causing caterpillars to develop approximately two weeks earlier, birds that are able to produce eggs earlier so they can rear young while caterpillars are available will have higher reproductive success than birds that cannot. |
| | Option A is incorrect | *P. major* cannot immediately change food sources. |
| | Option C is incorrect | *P. major* cannot choose how many eggs are laid. |
| | Option D is incorrect | The caterpillars are developing two weeks earlier. Hunting caterpillars earlier during the day when the temperature is cooler will have no effect on the abundance of caterpillars available. |

2021 STAAR Grade 8 Science Rationales

| Item# | Rationale | |
|---|---|---|
| 42 | Option J is correct | The geological feature labeled X is a body of water, such as a river. The geological feature becomes wider because the soil is being carried away by the water. |
| | Option F is incorrect | The geological feature labeled X is a body of water, such as a river. The water travels along this path but does not straighten the path. |
| | Option G is incorrect | The geological feature labeled X is a body of water, such as a river. Water eroding soil along this feature will not make the feature dry. The presence of water prevents this feature from becoming dry. |
| | Option H is incorrect | The geological feature labeled X is a body of water, such as a river. The water travels along this path but does not shorten the path. |