

2021 STAAR Biology Rationales

Item#	Rationale	
1	Option B is correct	The nerves in the integumentary system (skin) sense the irritation and send the signal to the brain. The brain then sends impulses through the nervous system to scratch the itch.
	Option A is incorrect	The circulatory system is responsible for transporting materials throughout the body. The excretory system is responsible for removing waste from the body.
	Option C is incorrect	The digestive system is responsible for breaking food down into nutrients that can be absorbed by the body. The muscular system is used for movement, posture, and circulation of blood throughout the body.
	Option D is incorrect	The respiratory system is responsible for the exchange of oxygen and carbon dioxide in the body. The lymphatic system is responsible for transporting lymph, a fluid containing infection-fighting white blood cells, throughout the body.

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Item#	Rationale	
2	Option F is correct	Cyclins control the progression through the cell cycle. If cyclins do not degrade, then cells will continue to go through the cell cycle, resulting in the formation of a tumor (uncontrolled cell growth).
	Option G is incorrect	Uncontrolled production of cyclins does not result in immediate death of the cell.
	Option H is incorrect	Uncontrolled production of cyclins would result in a tumor (uncontrolled cell growth) and not be transferred to other cells.
	Option J is incorrect	The formation of haploid cells is a result of a cell going through meiosis, not the cell cycle.

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Item#	Rationale	
3	Option C is correct	This type of mutation is a substitution because the T nucleotide in the GTA DNA triplet was replaced with a G nucleotide in the mutated DNA triplet.
	Option A is incorrect	Insertion mutations occur when a nucleotide or sequence of nucleotides is inserted into the existing DNA without replacing any of the existing nucleotides.
	Option B is incorrect	Translocation mutations occur when a segment of a chromosome changes positions with a segment of another chromosome.
	Option D is incorrect	Deletion mutations occur when a nucleotide or sequence of nucleotides are deleted from the existing DNA.

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Item#	Rationale	
4	Option J is correct	The resistant individuals that survive the spraying of pesticide are able to reproduce. This resistance is likely due to a genetic variation that has been inherited from their parents. As the pesticide-resistant insects reproduce, the genetic variant that makes them resistant to the pesticide will become more prevalent in the population.
	Option F is incorrect	The resistant insects were not able to transform the pesticide into a safe form. They were able to survive and reproduce, producing resistant offspring.
	Option G is incorrect	The resistant insects may have been able to grow larger; however, this would not have resulted in the pesticide becoming ineffective. The resistant individuals were able to survive and reproduce, producing resistant offspring.
	Option H is incorrect	The resistant insects may be able to eat the contaminated food; however, it is their ability to survive and reproduce that would make the pesticide ineffective.

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Item#	Rationale	
5	Option B is correct	The main function of the wings of the Gentoo penguin and the legs of the common ostrich is for locomotion, which allows the birds to escape from predators.
	Option A is incorrect	The ability to find prey is related to sensory organs and not locomotive organs.
	Option C is incorrect	The ability to control body temperature is related to the circulatory system and the feathers in the integumentary system and not related to locomotive structures.
	Option D is incorrect	The ability to be camouflaged within their environments is related to the coloration of their feathers and not to locomotive structures.

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Item#	Rationale	
6	Option F is correct	All living things are made of cells, which contain DNA made of the nucleotides adenine, thymine, guanine, and cytosine.
	Option G is incorrect	Only plant cells are surrounded by a cell wall made of cellulose.
	Option H is incorrect	Prokaryotic cells do not have a membrane-bound nucleus.
	Option J is incorrect	Prokaryotic cells do not have mitochondria.

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Item#	Rationale	
7	Option D is correct	Using the general 10% law, which states 90% of the energy is lost at each trophic level (grass being at 100%), the hognose snakes would receive 0.1% of the energy produced by the grass, and at most, the owl could receive 1% of the energy produced by the grass.
	Option A is incorrect	The cricket could receive 10% of the energy produced by the grass, and the sparrows could receive 1% of the energy produced by the grass.
	Option B is incorrect	The toads could receive 1% of the energy produced by the grass, and the spiders could receive 1% of the energy produced by the grass.
	Option C is incorrect	The rabbits could receive 10% of the energy produced by the grass, and the owls could receive 1% of the energy produced by the grass.

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Item#	Rationale	
8	Option G is correct	The process of the cell cycle is how living organisms produce more cells, which allow the organisms to grow, develop, and reproduce.
	Option F is incorrect	A life cycle that contains fertilized eggs is an example of sexual reproduction, and does not produce clones.
	Option H is incorrect	Most frog offspring are produced by fertilization of gametes, which are produced through meiosis, not the cell cycle.
	Option J is incorrect	Natural selection of certain traits in the frog allows for the frogs that are best adapted to survive and reproduce.

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Item#	Rationale	
9	Option B is correct	Light energy is captured by the pigments in leaves during photosynthesis. The light energy is converted into chemical energy in the bonds of glucose, which is made during photosynthesis. Glucose is then used during cellular respiration to make another kind of chemical energy, ATP.
	Option A is incorrect	Chemical energy stored in the bonds of glucose is used during cellular respiration, and heat is released; however, this heat is not used by producers during photosynthesis to make light energy.
	Option C is incorrect	Thermal energy is not produced during photosynthesis or used during cellular respiration.
	Option D is incorrect	Cellular respiration does not use light energy to make chemical energy for photosynthesis.

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Item#	Rationale	
10	Option G is correct	Overfishing decreases the stability of the ecosystem by disrupting the food chains of other organisms within the ecosystem. This causes an imbalance in predator-prey relationships, resulting in either a decrease in certain organisms or an increase in others.
	Option F is incorrect	Increasing competition for resources would result in a decrease in ecosystem stability.
	Option H is incorrect	Overfishing affects multiple species in the ecosystem, not just one.
	Option J is incorrect	Overpopulation results in a decrease of ecosystem stability because it increases competition for resources.

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Item#	Rationale	
11	Option C is correct	Hydrogen bonds connect the nitrogenous bases of the DNA strands.
	Option A is incorrect	Nucleotides are what are connected by the labeled hydrogen bonds in the DNA segment.
	Option B is incorrect	Phosphate groups are a part of the backbone of the DNA segment. The backbone is the part of the DNA segment that the nucleotides are attached to.
	Option D is incorrect	Deoxyribose is a part of the backbone of the DNA segment. The backbone is the part of the DNA segment that the nucleotides are attached to.

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Item#	Rationale	
12	Option G is correct	ATP is the chemical energy that is used to power all cellular processes, including chemical reactions. DNA is the molecule that carries and transmits the genetic information of organisms.
	Option F is incorrect	DNA is the molecule that carries and transmits the genetic information of organisms. Enzymes are the molecules that serve as biological catalysts that speed up the rate of chemical reactions.
	Option H is incorrect	Enzymes are the molecules that serve as biological catalysts that speed up the rate of chemical reactions. Cellulose is the type of sugar that is used for structural support in the cell walls of plants.
	Option J is incorrect	Cellulose is the type of sugar that is used for structural support in the cell walls of plants. ATP is the chemical energy that is used to power all cellular processes, including chemical reactions.

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Item#	Rationale	
13	Option A is correct	The vertebral column is the trait that is at the root of the cladogram. The root of the cladogram represents the initial ancestor/trait that is common to all the organisms within the cladogram.
	Option B is incorrect	The trait for hair is common to the horse, wolf, tiger, and house cat, but not the turtle.
	Option C is incorrect	The traits for sharp teeth and retractable claws are common to the tiger and house cat, but not the turtle, horse, or wolf.
	Option D is incorrect	The ability to purr is only found in the house cat and not in the turtle, horse, wolf, or tiger.

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Item#	Rationale	
14	Option F is correct	Eukaryotic cells have DNA chromosomes contained in a membrane-bound nucleus. Prokaryotic cells have DNA chromosomes in the cytoplasm and do not have a nucleus or other membrane-bound organelles.
	Option G is incorrect	Eukaryotic cells have DNA chromosomes contained in a membrane-bound nucleus, not free-floating within the cytoplasm.
	Option H is incorrect	Eukaryotic cells have DNA chromosomes contained in a membrane-bound nucleus. Prokaryotic cells have DNA chromosomes in the cytoplasm and do not have a nucleus or other membrane-bound organelles.
	Option J is incorrect	Eukaryotic cells have membrane-bound organelles. Prokaryotic cells have DNA chromosomes in the cytoplasm and do not have a nucleus or other membrane-bound organelles.

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Item#	Rationale	
15	Option C is correct	The Mexican long-nosed bats have traits that are more favorable over other bats and that help them to be successful in their environment.
	Option A is incorrect	An increase in predation by other species is not a trait or behavior that would allow the bat to survive and reproduce.
	Option B is incorrect	Mutations that do not increase survival or reproductive success are not considered adaptations.
	Option D is incorrect	Intentional breeding is an example of artificial selection. In artificial selection, organisms are intentionally mated to produce offspring with a desired outcome or trait.

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Item#	Rationale	
16	Option G is correct	Osmosis is the diffusion of water molecules across the plasma membrane from a less concentrated solution into a more concentrated solution without the use of active transport and energy from ATP. As the water molecules move, the concentrations on each side of the membrane become more equal.
	Option F is incorrect	Osmosis is a form of passive transport and would not require energy from sugar molecules, nor is it dependent on the cell's ability to divide.
	Option H is incorrect	While ions can be transported by both active or passive transport across the plasma membrane, osmosis only describes the movement of water into and out of the cell.
	Option J is incorrect	Enzymes would move across the plasma membrane with the use of a protein channel and would not be able to diffuse through the plasma membrane.

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Item#	Rationale	
17	Option D is correct	As more varieties of plants are able to grow on the sand dunes, a wider variety of animals and insects will also be able to survive on the sand dunes. This increase in different plant and animal species leads to an increase in species diversity.
	Option A is incorrect	As more plants are able to grow on the sand dunes, the number of beneficial bacteria will also increase.
	Option B is incorrect	As more plants are able to grow on the sand dunes, more consumers will be able to feed on and acquire energy from the plants.
	Option C is incorrect	As more plants are able to grow on the sand dunes, the root systems will be able to hold the sand stable and reduce the amount of erosion occurring.

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Item#	Rationale	
18	Option G is correct	Organisms in Kingdom Protista are eukaryotic, unicellular, and can be either autotrophic or heterotrophic.
	Option F is incorrect	Organisms in Kingdom Bacteria are not eukaryotic.
	Option H is incorrect	Organisms in Kingdom Archaea are not eukaryotic.
	Option J is incorrect	Organisms in Kingdom Animalia are not unicellular.

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Item#	Rationale	
19	Option C is correct	Enzymes are specific to certain substrates. The shape of the enzyme and shape of the substrate fit together at the active site, similar to puzzle pieces.
	Option A is incorrect	If the active site of an enzyme is occupied by an inhibitor, then the substrate will not be able to attach to the enzyme at the active site.
	Option B is incorrect	The function of enzymes is to lower the activation energy level of a chemical reaction.
	Option D is incorrect	Enzymes are not typically destroyed during reactions and can be used over and over again.

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Item#	Rationale	
20	Option G is correct	The genes that control the snowshoe hare's coat color are turned on and off based on the amount of daylight, thus changing the color of the hare's coat during different seasons.
	Option F is incorrect	Mutations are not reversible. If a mutation occurred to change the snowshoe hare's coat color, it would not be able to change back to its original form during the lifetime of the hare.
	Option H is incorrect	While sunlight may cause cancer cells to develop, it is not the underlying mechanism that causes the seasonal changes in the coat color in snowshoe hares.
	Option J is incorrect	Genes are not removed from genomes during a lifetime or a season. All genes are present in all cells and can be signaled to be on or off depending on different external factors.

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Item#	Rationale	
21	Option C is correct	Parasites require a host organism in order to survive. They typically steal nutrients or resources from the host, resulting in decreased/slowed growth of the host. This graph shows that Plant 1, the host, grows better once Plant 2, the parasite, has been removed and Plant 2, the parasite, has decreased growth.
	Option A is incorrect	This graph does not represent a parasitic relationship because Plant 2, the parasite, continues to increase in growth after it has been removed from Plant 1, the host.
	Option B is incorrect	This graph does not represent a parasitic relationship because both Plant 1 and Plant 2 have decreased growth after Plant 2 has been removed.
	Option D is incorrect	This graph does not represent a parasitic relationship because both Plant 1 and Plant 2 continue to grow well after they have been separated.

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Item#	Rationale	
22	Option G is correct	Transitional fossils are the remains of organisms that are older versions of a species and its more recent ancestors. Transitional fossils would show evidence of gradualism, a form of evolution where a species evolves continually over long periods of time.
	Option F is incorrect	Transitional fossils would not show the seasonal change in the diet of a species.
	Option H is incorrect	While DNA may be able to be found in transitional fossils, the majority of all living organisms use DNA as genetic material.
	Option J is incorrect	Transitional fossils across many rock layers provide evidence of a slowly changing environment.

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Item#	Rationale	
23	Option D is correct	Environmental factors such as chemicals, temperature, and light can determine which genes are turned on and off, thereby influencing the way an organism develops and functions.
	Option A is incorrect	Mitosis is not the mechanism by which genes are activated as a result of environmental factors.
	Option B is incorrect	Genes are not activated during the stage of meiosis when homologous chromosome pairs are separated to create haploid gametes because the chromosomes are condensed.
	Option C is incorrect	The size of the genome of an organism stays the same throughout its life.

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Item#	Rationale	
24	Option H is correct	In order to self-pollinate, a pollen grain from a flower would need to be transferred from the anther of that flower to the stigma of the same flower.
	Option F is incorrect	Anthers cannot be transferred from flower to flower. Pollen grains are what need to be transferred in order to pollinate a flower.
	Option G is incorrect	Ovules cannot be transferred from flower to flower. Pollen grains are what need to be transferred in order to pollinate a flower.
	Option J is incorrect	Ovaries cannot be transferred from flower to flower. Pollen grains are what need to be transferred in order to pollinate a flower.

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Item#	Rationale	
25	Option B is correct	Aagg is not a possible outcome from this cross because there is only one g allele present in the parent generation.
	Option A is incorrect	The only possible outcomes for this genetic cross are: AaGG, AaGg, aaGG, and aaGg.
	Option C is incorrect	The only possible outcomes for this genetic cross are: AaGG, AaGg, aaGG, and aaGg.
	Option D is incorrect	The only possible outcomes for this genetic cross are: AaGG, AaGg, aaGG, and aaGg.

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Item#	Rationale	
26	Option J is correct	The function of these three systems interacting begins when the salivary enzymes in the digestive system break down food into nutrients. A hormone signal triggers the endocrine system to absorb these nutrients into the bloodstream, which is part of the circulatory system.
	Option F is incorrect	The function of the integumentary system is to act as a barrier to protect the body from the outside world. The function of the muscular system is movement. These two body systems are not interacting to cause the listed processes to occur.
	Option G is incorrect	The function of the excretory system is to remove waste from the body. The function of the immune system is to protect the body from foreign pathogens such as microbes or chemicals. The function of the muscular system is movement. These three body systems are not interacting to cause the listed processes to occur.
	Option H is incorrect	The function of the excretory system is to remove waste from the body. The function of the immune system is to protect the body from foreign pathogens such as microbes or chemicals. These two body systems are not interacting to cause the listed processes to occur.

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Item#	Rationale	
27	Option A is correct	<p>The DNA sequence of a gene is used to make an mRNA copy. The mRNA copy is then translated into a sequence of amino acids.</p> <p>This DNA sequence codes the sequence of amino acids as shown:</p> <p>DNA: 3' TCA TGC ATG 5'</p> <p>mRNA: 5' AGU ACG UAC 3'</p> <p>Amino acid sequence: Serine - Threonine - Tyrosine</p>
	Option B is incorrect	The DNA triplet TGC would not be translated into the amino acid serine.
	Option C is incorrect	The DNA triplet ATG would not be translated into the amino acid methionine.
	Option D is incorrect	The DNA triplets TGC and ATG would not be translated into the amino acids alanine and methionine.

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Item#	Rationale	
28	Option H is correct	Many insects are beneficial to farmers for pollination. This introduced bird may also feed on the beneficial insects as well as the pest insects and reduce the pollination of the crop.
	Option F is incorrect	Increasing the biodiversity of the native plant species would be a beneficial impact.
	Option G is incorrect	Typically, birds that feed on insects are not pollinators.
	Option J is incorrect	Different species of birds will not be able to mate successfully.

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Item#	Rationale	
29	Option D is correct	Large, round ears are keyed from 5a. Step 5 is keyed by 3b (less than 35 cm wingspan). Step 3 is keyed by 1b (colonial bat). Together, these indicate that the Mexican free-tailed bat has large, round ears, a less than 35 cm wingspan, and is colonial.
	Option A is incorrect	A solitary bat with a wingspan greater than 35 cm is the Hoary bat.
	Option B is incorrect	A solitary bat with a wingspan less than 35 cm would be either the Seminole bat or the Eastern red bat.
	Option C is incorrect	A colonial bat with a wingspan greater than 35 cm would be the Big brown bat.

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Item#	Rationale	
30	Option H is correct	Blue yarn represents genetic material. All prokaryotic cells, eukaryotic cells, and viruses have genetic material.
	Option F is incorrect	Yellow paper ovals represent cytoplasm. Viruses do not contain cytoplasm.
	Option G is incorrect	Gray paper hexagon represents a capsid. Capsids are only present in viruses.
	Option J is incorrect	Orange paper circles represent a nucleus. Prokaryotic cells and viruses do not have a nucleus.

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Item#	Rationale	
31	Option C is correct	Both carbohydrates and lipids are used to store energy.
	Option A is incorrect	Although some hormones are derived from lipids, carbohydrates do not produce hormones.
	Option B is incorrect	Cellulose is a type of carbohydrate used as the structural support of cell walls. Lipids are not used as the structural support of cell walls.
	Option D is incorrect	Enzymes, a type of protein, are used as catalysts for chemical reactions.

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Item#	Rationale	
32	Option G is correct	Producers use carbon dioxide during photosynthesis and convert it into glucose. Consumers then ingest the carbon in the glucose and use that glucose during cellular respiration, releasing carbon dioxide as they exhale.
	Option F is incorrect	Consumers release carbon dioxide when they exhale, and producers take it in during photosynthesis.
	Option H is incorrect	Producers take in carbon dioxide from the atmosphere.
	Option J is incorrect	Consumers take in carbon by ingesting producers or other consumers that contain carbon.

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Item#	Rationale	
33	Option A is correct	The plasma membrane contributes to cellular homeostasis by controlling what can enter and exit the cell.
	Option B is incorrect	The plasma membrane does not catalyze the production of proteins.
	Option C is incorrect	The plasma membrane does not convert ATP to glucose.
	Option D is incorrect	The plasma membrane does not catalyze the production of proteins.

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Item#	Rationale	
34	Option F is correct	The sequence of the nucleotides determines what traits will be expressed, such as coat color in cattle.
	Option G is incorrect	The number of chromosomes in the somatic cells responsible for coat color in Texas Longhorn cattle is normally the same.
	Option H is incorrect	Diet can have an effect on the coat color of cattle; however, it is not the genetic basis of the coat color.
	Option J is incorrect	Environmental conditions can have an effect on the coat color of cattle; however, it is not the genetic basis of the coat color.

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Item#	Rationale	
35	Option D is correct	The Northern leopard frog and the bullfrog are the most closely related of these species because they share the same Genus.
	Option A is incorrect	The Northern cricket frog and the bullfrog share the same Order, which is a more general classification than Family or Genus.
	Option B is incorrect	The Northern leopard frog and the green treefrog share the same Order, which is a more general classification than Family or Genus.
	Option C is incorrect	The Northern cricket frog and the green treefrog share the same Family, which is a more general classification than Genus.

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Item#	Rationale	
36	Option G is correct	Organs work together to make up an organ system. Organ systems work together to make up an organism. A group of organisms of the same species makes up a population. A group of populations in the same area make up a community.
	Option F is incorrect	Cells are the basic unit of life. A group of cells working together makes up tissues. A group of tissues working together make up an organ.
	Option H is incorrect	A group of communities in a certain area as well as all of the nonliving components of that area, such as water, rocks, and dirt, make up an ecosystem.
	Option J is incorrect	A biosphere consists of all the ecosystems on Earth.

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Item#	Rationale	
37	Option D is correct	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.
	Option A is incorrect	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.
	Option B is incorrect	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.
	Option C is incorrect	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.

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Item#	Rationale	
38	Option G is correct	<p>The hyenas and gray wolves have a mutualistic relationship because both organisms benefit from each other. The hyenas have access to food sources the gray wolves hunt, and the gray wolves have access to bone marrow after the hyenas have cracked open the large bones of the prey.</p> <p>The gray wolves and goats have a predator-prey relationship because the gray wolves hunt and feed on the goats.</p>
	Option F is incorrect	Hyenas are not a predator or prey of gray wolves. Gray wolves and goats do not have a commensalistic relationship because the goats are harmed.
	Option H is incorrect	Hyenas and gray wolves do not exhibit a parasitic relationship because neither the hyenas nor the gray wolves require the other to survive. Gray wolves and goats do not exhibit a mutualistic relationship because the goats are harmed.
	Option J is incorrect	Hyenas and gray wolves do not exhibit a commensalistic relationship because both benefit from the relationship. Gray wolves and goats do not exhibit a parasitic relationship because neither require the other to live and survive.

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Item#	Rationale	
39	Option A is correct	During interphase, the cell is growing in size (G_1), replicating its DNA (S phase), and duplicating its cell structures (G_2) to prepare for cellular division.
	Option B is incorrect	The cessation of cellular processes and the activity of lysosomes are not responsible for the length of time cells spend in interphase.
	Option C is incorrect	The synthesis of spindle fibers takes place in M phase, not interphase.
	Option D is incorrect	Cytokinesis, division of the cytoplasm, is completed directly after mitosis (M phase) and is not part of interphase.

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Item#	Rationale	
40	Option H is correct	Many organisms do not provide care or protection for their offspring. Laying a large quantity of eggs helps to ensure that some individuals will survive to adulthood and reproduce.
	Option F is incorrect	The number of eggs laid will not impact the average body size of individuals that survive.
	Option G is incorrect	If all hatchlings were to survive, laying a large quantity of eggs would increase competition among the octopus species.
	Option J is incorrect	The quantity of hatchlings does not impact the likelihood that a single hatchling will be consumed.

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Item#	Rationale	
41	Option A is correct	A black angelfish has a genotype of BB. A black-lace angelfish has a genotype of BL. A cross between BB × BL results in a probability of 50% of the offspring having the genotype BB and phenotype of black and 50% of the offspring having the genotype BL and phenotype of black lace.
	Option B is incorrect	The genetic cross that would result in 50% silver (LL) and 50% black (BB) would be a silver (LL) crossed with a black lace (BL).
	Option C is incorrect	The genetic cross that would result in 25% silver (LL), 25% black (BB), and 50% black lace (BL) would be a black lace (BL) crossed with another black lace (BL).
	Option D is incorrect	There is no genetic cross from these genotypes that would result in 25% silver (LL), 50% black (BB), and 25% black lace (BL).

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Item#	Rationale	
42	Option H is correct	The loggerhead sea turtle occupies the primary consumer level by feeding on the clover grass and the secondary consumer level by feeding on the gulf pipefish.
	Option F is incorrect	The Canada goose occupies only the primary consumer level in this food web by feeding on only the producer, the clover grass.
	Option G is incorrect	The Eastern cottontail occupies only the primary consumer level in this food web by feeding on only the producer, the clover grass.
	Option J is incorrect	The sand dollar occupies only the primary consumer level in this food web by feeding on only producers, clover grass and phytoplankton.

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Item#	Rationale	
43	Option B is correct	The virus must enter the host cell in order to use the cell's machinery to make new viral particles.
	Option A is incorrect	The virus must enter the host cell in order to produce new viruses.
	Option C is incorrect	Viruses must use a cell's machinery to make new viruses. Gametes, egg and sperm, are made through meiosis.
	Option D is incorrect	Carbon dioxide is not needed by the virus or the host cell in order to make a new virus.

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Item#	Rationale	
44	Option H is correct	Each node on the cladogram represents a speciation event. <i>Haplonycteris fischeri</i> and <i>Ptenochirus jagori</i> are the least related because they are separated by six nodes, or where a speciation event took place.
	Option F is incorrect	<i>Ptenochirus minor</i> and <i>Megaerops niphanae</i> are separated by only two nodes.
	Option G is incorrect	<i>Dyacopterus spadiceus</i> and <i>Otopteropus cartilagonodus</i> are separated by only three nodes.
	Option J is incorrect	<i>Cynopterus sphinx</i> and <i>Chironax melanocephalus</i> are separated by only three nodes.

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Item#	Rationale	
45	Option D is correct	Bacteria break down the organic matter in dead and decaying organisms and return that material to the soil. The organic matter can then be used by plants for growth.
	Option A is incorrect	Plants are producers. Plants are able to grow due to the organic material that is added to the soil from decomposers.
	Option B is incorrect	The production of toxins does not describe how bacteria recycle matter in the ecosystem.
	Option C is incorrect	The ability of bacteria to cause disease does not describe how bacteria recycle matter in an ecosystem.

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Item#	Rationale	
46	Option F is correct	The hormone auxin responds to light stimulus and promotes cell elongation on the side of the stem that is not exposed to light. This causes the stem to bend toward the direction of the light.
	Option G is incorrect	Sugars are produced during the process of photosynthesis, and not in response to gravity.
	Option H is incorrect	The production of carbon dioxide does not cause plant shoots to bend toward the light, the hormone auxin does.
	Option J is incorrect	Water production during respiration does not cause the bending of shoots toward the light. Water is lost to the air through the process of transpiration, which occurs in the leaves.

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Item#	Rationale	
47	Option C is correct	During the lytic cycle, the virus enters the host cell and uses its machinery to produce new viruses. The cell then ruptures, releasing and spreading the virus in the body.
	Option A is incorrect	Viruses that reproduce via the lytic and lysogenic cycles can both be transmitted by mosquitoes.
	Option B is incorrect	Vaccinations work to prevent the reproduction of viruses.
	Option D is incorrect	The symptom of a fever would indicate the virus is actively reproducing new virus particles, which would indicate that the virus is in the lytic cycle rather than the lysogenic cycle.

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Item#	Rationale	
48	Option J is correct	The process represented is crossing-over. During crossing-over, bits of one chromosome cross over another chromosome and that genetic information is exchanged, creating a new genetic variant.
	Option F is incorrect	The process of crossing-over depicted here does not directly contribute to an organism's ability to grow and heal itself.
	Option G is incorrect	The process of crossing-over prevents the production of clones since it is creating new genetic variants.
	Option H is incorrect	The process of crossing-over occurs after the DNA in the homologous chromosome pairs have already been copied.

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Item#	Rationale	
49	Option C is correct	The diaphragm is a muscle located under the ribs. When the diaphragm contracts, it moves downward, increasing the space within the chest and allowing the lungs to expand and bring in air. When the diaphragm relaxes, it moves upward, decreasing the space within the chest and expelling the air from the lungs.
	Option A is incorrect	Hormones are produced by the endocrine system.
	Option B is incorrect	Urine is eliminated by the excretory system.
	Option D is incorrect	Nutrients are absorbed in the digestive system.

2021 STAAR Biology Rationales

Item#	Rationale	
50	Option J is correct	The scientific names of organisms are assigned a genus and species and are individual. Different species will not have the same scientific name. The species part of the name is the most specific and will ensure the scientists are studying the same type of firefly.
	Option F is incorrect	The size of the population can be determined by many factors and will not ensure the scientists are studying the same type of firefly.
	Option G is incorrect	Fireflies can live in many different habitats. Studying the habitats of the fireflies will not ensure the scientists are studying the same type of firefly.
	Option H is incorrect	All types of fireflies can emit light. Studying the color of light produced may help the scientists study similar fireflies, but it will not ensure they are studying the same type of firefly.