

## 2018 STAAR Biology Rationales

Item #	Rationales	
1	Option B is correct	Similarities between the fragment sizes, distance traveled, and quantities indicate relatedness of individuals.
	Option A is incorrect	The age of an individual cannot be accurately determined through DNA fragments; therefore gel electrophoresis is not used for determining age.
	Option C is incorrect	Gel electrophoresis cannot be used to determine the effectiveness of medication but can be used to identify more effective medications through DNA markers.
	Option D is incorrect	Gel electrophoresis, as described in the question, is used to separate DNA fragments, not proteins, which are key indicators of blood type.
2	Option J is correct	Vesicles function as a means for transporting molecules out of the cell. The arrows indicate movement from the Golgi apparatus, where molecules are modified and packaged to be sent to where they are needed inside or outside of the cell.
	Option F is incorrect	Protein synthesis occurs in the ribosome.
	Option G is incorrect	The Golgi apparatus does not have genetic information to exchange.
	Option H is incorrect	The Golgi apparatus does not regenerate in this way.
3	Option B is correct	Based on the data, the enzyme has the highest rate of reaction at 37 °C and at a pH of 6, which indicates the enzyme works best where the rate is highest.
	Option A is incorrect	The rate of reaction at 27 °C and at a pH of 4 is increasing to reach its highest rate of reaction. This indicates that the enzyme is not functioning at its maximum potential.
	Option C is incorrect	At 40 °C and at a pH of 8 the enzyme is beginning to denature, losing its original form. The rate of reaction has decreased due to this process.
	Option D is incorrect	At 50 °C and at a pH of 10 the enzyme has denatured and can no longer catalyze the reaction.
4	Option F is correct	The Indian leaf butterfly mimics dead leaves, which allows it to remain unseen by predators. The monarch butterfly uses bright coloration to warn predators that it is poisonous.
	Option G is incorrect	The Indian leaf butterfly is not attacking the predator when it is mimicking dead leaves. The monarch butterfly is only poisonous if eaten, and it is not venomous.
	Option H is incorrect	The monarch butterfly is brightly colored, so it would not be camouflaged in its environment.
	Option J is incorrect	The described appearances of the butterflies do not indicate a relationship between the different butterfly species.
5	Option C is correct	The female reproductive organs, the ovaries, produce the hormones estrogen and progesterone, which are involved in menstruation. The ovaries are also a major gland of the endocrine system, which is responsible for the production and release of all hormones in the body.
	Option A is incorrect	Waste removal is not the main purpose that results from these two systems working together.
	Option B is incorrect	The endocrine, circulatory, and nervous systems are most directly involved with the release of neurotransmitters during stress.
	Option D is incorrect	Gas exchange is primarily controlled by interactions between the respiratory and circulatory systems.
6	Option G is correct	Organism 2 does not share any amino acids in the same sequence as the other organisms presented in the table, indicating that it is the least related to the other organisms.
	Option F is incorrect	Organism 1 shares two amino acids in the same position as Organisms 3 and 4.
	Option H is incorrect	Organism 3 shares two amino acids in the same position as Organism 1 and three amino acids in the same position as Organism 4.
	Option J is incorrect	Organism 4 shares two amino acids in the same position as Organism 1 and three amino acids in the same position as Organism 3.

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7	Option A is correct	Antibodies are created by the immune system in response to the virus. When the individual comes in contact with the virus again, the immune system “remembers” the virus to produce antigen-specific antibodies to attack the virus quickly and efficiently.
	Option B is incorrect	Weakened viruses do not attach to unaffected viruses.
	Option C is incorrect	The introduction of the weakened virus would not greatly impact the rate of genetic mutation in the host.
	Option D is incorrect	Weakened viruses are introduced into the host organism to trigger an immune response.
8	Option J is correct	The possible blood types from the cross are: A, B, AB, or O.
	Option F is incorrect	The cross described cannot only produce type O blood because the A and B alleles are dominant to the O allele.
	Option G is incorrect	The cross described cannot only produce types A and B because both individuals carry the O allele.
	Option H is incorrect	The cross described cannot only produce types A, B, or O because the A and B alleles are codominant, making the type AB.
9	Option A is correct	In mutualistic relationships, both species benefit. Intestinal bacteria are benefited by receiving nutrients from the gut, and humans benefit from the relationship by receiving vitamin K from the bacteria.
	Option B is incorrect	Bacteria becoming resistant to antibiotics would only benefit the bacteria and cause harm to the human.
	Option C is incorrect	Bacteria that produce toxins that damage healthy tissues would cause harm to the human.
	Option D is incorrect	Bacteria being consumed by humans and causing food poisoning would result in harm to the human.
10	Option J is correct	mRNA is transcribed from DNA and contains the information needed to produce proteins.
	Option F is incorrect	Cellular respiration, which occurs in the mitochondria, has the role of making energy for cellular activities.
	Option G is incorrect	Bond formation is not the unique role of mRNA in making specialized structures or proteins.
	Option H is incorrect	Sugars are produced during photosynthesis in the chloroplast.
11	Option B is correct	Each organism is classified in the same genus, <i>Paramecium</i> , but has a different species name.
	Option A is incorrect	Families are broader than the genus species naming. If the organisms were classified in different families, they would most likely have different genus names.
	Option C is incorrect	Kingdoms are the most general classification group listed. If the organisms are in the same phylum, they have to be in the same kingdom.
	Option D is incorrect	If the organisms are in different orders, they most likely would also have different genus names.
12	Option H is correct	Nerve and brain cells are not sex cells, and therefore not involved in reproduction, so mutations in these cells would not genetically affect offspring.
	Option F is incorrect	An egg cell is a sex cell, and mutations in sex cells can be passed on to offspring.
	Option G is incorrect	A sperm cell is a sex cell, and mutations in sex cells can be passed on to offspring.
	Option J is incorrect	A sperm cell is a sex cell, and mutations in sex cells can be passed on to offspring.
13	Option D is correct	<i>Caulerpa</i> is an invasive species that would quickly outcompete native species for space and other resources.
	Option A is incorrect	The presence or absence of an invasive species in an ecosystem is not sufficient enough to determine an ecosystem’s health.
	Option B is incorrect	<i>Caulerpa</i> outcompeted other species, thereby decreasing biodiversity.
	Option C is incorrect	Based on the information given, <i>Caulerpa</i> did not interbreed with native species.

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14	Option F is correct	The DNA template strand codes for the amino acid chain, Arginine-Leucine-Proline-Asparagine-Lysine-Arginine, as shown. DNA Template: 3'TCC AAT GGC TTA TTT GCA5' mRNA: 5'AGG UUA CCG AAU AAA CGU3' amino acid: Arginine- Leucine- Proline- Asparagine- Lysine- Arginine
	Option G is incorrect	In order to code for Tryptophan, the first three letters of DNA must be ACC.
	Option H is incorrect	The first amino acid coded for in the original DNA strand is Arginine. In order to code for Serine, the first three letters of DNA must be AGT, AGA, AGC, AGG, TCA, or TCG.
	Option J is incorrect	The first amino acid coded for in the original DNA strand is Arginine. In order to code for Tryptophan, the first three letters of DNA must be ACC.
15	Option D is correct	Root hairs are tiny tube-like structures that increase the surface area of the roots, which increases absorption of nutrients and water.
	Option A is incorrect	Minerals are not converted into glucose. Glucose is produced in the leaves from carbon dioxide and water.
	Option B is incorrect	Root hairs do not decrease the need for osmosis and diffusion in vascular tissue.
	Option C is incorrect	The stomata in the leaves are the site of transpiration and gas exchange.
16	Option F is correct	The temperature of the ice pack activated the genes for black hair.
	Option G is incorrect	A decrease in body temperature would not cause a DNA mutation.
	Option H is incorrect	The age of the Himalayan rabbit would not affect the hair color in the shaved area.
	Option J is incorrect	Based on the information provided, the Himalayan rabbit has white hair color any time of year.
17	Option D is correct	Mowing keeps the area in early secondary succession by preventing the growth of species present in later succession.
	Option A is incorrect	Mowing cannot change the likelihood of an area being affected by a nonnative species.
	Option B is incorrect	Mowing decreases the chances of other species growing on the field.
	Option C is incorrect	Mowing has little effect on the establishment of different communities.
18	Option H is correct	Animals are eukaryotic, motile (capable of motion), and reproduce sexually. Some protists are eukaryotic, motile, and can reproduce sexually.
	Option F is incorrect	Animals are not photosynthetic.
	Option G is incorrect	Animals are not photosynthetic.
	Option J is incorrect	Animals are not prokaryotic.
19	Option D is correct	S phase, also known as synthesis phase, is when the process of DNA replication occurs during the cell cycle.
	Option A is incorrect	Mitosis is the process of nuclear division in the cell cycle. DNA replication occurs before this phase in the cell cycle.
	Option B is incorrect	G <sub>1</sub> phase, also known as first gap phase, is when the cell is growing larger and preparing organelles and macromolecules for cell division.
	Option C is incorrect	G <sub>2</sub> phase, also known as second gap phase, is when the cell is growing more and making organelles and proteins in preparation for cell division.

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20	Option G is correct	The American alligator is a top predator because it is not listed as an energy source for any other organism in the table provided.
	Option F is incorrect	The Grass carp is not a top predator because fish are an energy source for raccoons, great blue herons, American alligators, and Eastern mud turtles.
	Option H is incorrect	The Eastern mud turtle is not a top predator because it is an energy source for the American alligator and raccoons.
	Option J is incorrect	The Great blue heron is not a top predator because it is an energy source for the American alligator.
21	Option A is correct	The hybrid species receives beneficial genes from both parental species that increases its ability to survive.
	Option B is incorrect	Traits acquired through hybridization would have to benefit the white cattail in order to contribute to its success.
	Option C is incorrect	Inheriting traits that make organisms susceptible to disease does not contribute to their success.
	Option D is incorrect	Genetic diversity is increased in hybrid species.
22	Option H is correct	Kidneys will decrease urine production in order to prevent dehydration after excessive sweating.
	Option F is incorrect	Blood pH is not maintained by decreasing urine production.
	Option G is incorrect	Excessive sweating would remove salt from the body.
	Option J is incorrect	Excessive sweating would not change the nutrients in the body.
23	Option D is correct	The scientific naming system is standardized to avoid the confusion common names may have, especially in other areas in which organisms have different common names.
	Option A is incorrect	Scientific names can still change after extinction due to increased knowledge of organisms.
	Option B is incorrect	The classification system is constantly being altered as new information is found about different organisms. As new organisms are discovered, new relationships are uncovered that can change the classification of previously found organisms.
	Option C is incorrect	Organisms placed in multiple genus and species levels would obscure the identity of the organisms further.
24	Option F is correct	DNA contains hydrogen, phosphorus, and nitrogen. These elements all can be found in a single nucleotide, the building block of DNA.
	Option G is incorrect	Aluminum, silicon, and copper are not elements found in a nucleotide of DNA.
	Option H is incorrect	Calcium and potassium are not elements found in a nucleotide of DNA.
	Option J is incorrect	Iron and magnesium are not elements found in a nucleotide of DNA.
25	Option D is correct	Saprophytes externally digest dead or decaying organisms to break down and return organic material to the soil.
	Option A is incorrect	Saprophytes return organic material to the soil.
	Option B is incorrect	Saprophytes do not extract minerals from living tissues. Saprophytes only consume dead or decaying tissue.
	Option C is incorrect	Saprophytes are not contained within the vascular tissues of autotrophs (plants and algae).
26	Option G is correct	Proteins build muscle and collagen in tendons and ligaments. Carbohydrates provide energy.
	Option F is incorrect	While carbohydrates and lipids provide energy, the second part of the claim, building lean muscle and strengthening tendons and ligaments is not addressed.
	Option H is incorrect	Increasing nucleic acid intake does not cause an increase in lean muscle mass or strengthen tendons or ligaments.
	Option J is incorrect	Increasing nucleic acid intake does not cause an increase in lean muscle mass or strengthen tendons or ligaments.

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27	Option C is correct	Increasing temperatures of ocean waters due to climate changes resulted in tropical fish moving to different areas in the ocean with temperatures that suit them.
	Option A is incorrect	Fish die in dead zones due to lack of dissolved oxygen. Agricultural runoff provides excess nutrients that are used by producers. The producers overproduce, die, and decompose.
	Option B is incorrect	The effect of droughts on ocean salinity is not a major force for fish movement as many fish are sensitive to changes in salinity.
	Option D is incorrect	Lowering the pH of ocean waters will make the ocean uninhabitable for many fish species.
28	Option F is correct	Dark-colored beetles are more likely to be preyed upon because their coloration makes them more visible to predators while the light-colored beetles are more likely to increase since their coloration allows them to avoid predators better than dark-colored beetles.
	Option G is incorrect	Dark-colored beetles are more likely to be preyed upon because their coloration makes them more visible to predators.
	Option H is incorrect	Light-colored beetles are more likely to increase since their coloration allows them to avoid predators better than dark-colored beetles.
	Option J is incorrect	Predation would not change the natural habitat of the beetles.
29	Option C is correct	The cross between two heterozygous (having an allele for both traits) individuals with complete dominance will result in 75% of offspring showing the dominant phenotype (cloven hooves) and 25% of offspring expressing the recessive phenotype (mule-foot hooves).
	Option A is incorrect	The expected probability of mule-foot hooves, the recessive phenotype, or of homozygous (having two of the same alleles) dominant genotype is 25%.
	Option B is incorrect	It is not possible with the given cross and alleles to have 50% of offspring with cloven hooves.
	Option D is incorrect	Both parents have recessive alleles, allowing a 25% chance of having offspring with the recessive phenotype.
30	Option G is correct	A pollen grain from the male flower must land on the silks/stigmata of the female flowers. The pollen on the stigmata can then travel to the ovule for the plant to successfully self-fertilize.
	Option F is incorrect	The amount of tassels and silks do not prevent the plant from self-fertilizing.
	Option H is incorrect	The phloem is a type of vascular tissue responsible for transporting sugars in the plant.
	Option J is incorrect	Pollen is the part of the plant needed to fertilize an ovule. The tassels and silks do not have to come into direct contact for self-fertilization to occur.
31	Option C is correct	Fitness describes an organism's overall ability to survive and reproduce successfully (having viable and fertile offspring to carry traits to the next generation) within its environment.
	Option A is incorrect	Being able to escape from predators does not ensure reproductive success.
	Option B is incorrect	Strength does not determine survivability or reproductive success in certain environments.
	Option D is incorrect	Reaching the adult stage does not guarantee survivability or reproductive success.
32	Option J is correct	The diagram represents the process of crossing over. Crossing over provides genetic diversity in eukaryotic cells.
	Option F is incorrect	The diagram represents the crossing over of two homologous chromosomes during meiosis.
	Option G is incorrect	Crossing over does not occur in bacterial cells because DNA is not organized in homologous chromosome pairs.
	Option H is incorrect	Crossing over during meiosis would not produce genetically identical cells.

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33	Option C is correct	Many cells with the same function form tissues. Different tissues with similar functions form an organ, and many different organs that work together form an organ system.
	Option A is incorrect	A cell is not more complex than an organ, such as the heart.
	Option B is incorrect	Nostrils are not an example of an organ or organ system.
	Option D is incorrect	The integumentary system is the most complex item in this list.
34	Option G is correct	Only a plant cell would contain chloroplasts and a cell wall.
	Option F is incorrect	A nucleus can be found in an animal cell.
	Option H is incorrect	Cytoplasm and a nucleus can be found in an animal cell.
	Option J is incorrect	Cytoplasm and a cell membrane can be found in an animal cell.
35	Option D is correct	Gradualism suggests that species developed and evolved over time, whereas punctuated equilibrium suggests that species appear abruptly due to quick evolution between periods of stasis within the fossil record.
	Option A is incorrect	Spontaneous generation is the idea that organisms arise from nonliving things.
	Option B is incorrect	Embryological development (the study of the development of an organism) does not explain patterns seen in the fossil record.
	Option C is incorrect	Geographic distribution does not explain the sudden appearance of organisms in the fossil record.
36	Option H is correct	The sequence of nucleotide bases in the DNA molecule holds the genetic information for the coding of an organism's traits.
	Option F is incorrect	Hydrogen bonds are responsible for linking together nucleotide base pairs, not storing genetic information.
	Option G is incorrect	Carbons are part of the molecular structure of DNA, but they are not responsible for storing genetic information.
	Option J is incorrect	Phosphates are part of the molecular structure of DNA, but they are not responsible for storing genetic information.
37	Option C is correct	By increasing the rate of cellular respiration in the mitochondria, more ATP (cellular energy) can be created in a shorter period of time to supply energy demands by the immune system.
	Option A is incorrect	Cell division does not produce energy; it uses energy.
	Option B is incorrect	Cells require more glucose to break down for energy to respond to an infection.
	Option D is incorrect	Carbon dioxide is a by-product of cellular respiration and not required for the process.
38	Option G is correct	Similarities in nucleotide sequences mean that both zebra fish and humans have similar DNA and genes; therefore they are more likely to have the same genetic diseases.
	Option F is incorrect	Diet comparison of organisms does not determine how close two organisms are genetically.
	Option H is incorrect	Embryonic development does not determine how close two organisms are genetically.
	Option J is incorrect	Similarities in cellular processes for reproduction do not determine how close two organisms are genetically.
39	Option C is correct	The circulatory system carries blood which contains white blood cells, an immune system component, to the site of the injury.
	Option A is incorrect	Healthy cells are not destroyed by the immune cells in the blood.
	Option B is incorrect	Infected cells are destroyed and removed by specialized cells of the immune system.
	Option D is incorrect	Gas exchange only involves the circulatory system at the site of the injury and does not involve the immune system.

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40	Option G is correct	Group 1 is illustrating cells without organelles, which are prokaryotic cells. Group 2 is illustrating cells with organelles, which are eukaryotic cells.
	Option F is incorrect	Animal cells are eukaryotic and would have an illustration of cells with organelles.
	Option H is incorrect	One of the cells in Group 2 is a plant cell and is not capable of movement.
	Option J is incorrect	Fungal cells are eukaryotic and would have an illustration of cells with organelles. Bacterial cells are prokaryotic and would have an illustration of cells without organelles.
41	Option D is correct	Indicators of primary succession include the presence of rock and pioneer species (organisms that break down rock to create soil, such as lichen) and the lack of soil.
	Option A is incorrect	The open oak woodland represents a later stage in succession due to the presence of oaks.
	Option B is incorrect	Thick soil is present, which indicates a stage of succession after primary succession.
	Option C is incorrect	The floodplain is in secondary succession due to the presence of grasses and shrubs; soil is present.
42	Option F is correct	Stemmiulida and Merocheta share four common ancestors (as represented by the nodes) on the cladogram, while Penicillata and Merocheta share only one common ancestor.
	Option G is incorrect	Spirostreptida and Glomerida share only two common ancestors on the cladogram, while Sphaerotheriida and Glomerida share three common ancestors.
	Option H is incorrect	Polyzoniida and Glomeridesmida share only two common ancestors on the cladogram, while Sphaerotheriida and Glomeridesmida share three common ancestors.
	Option J is incorrect	Merocheta and Glomeridesmida share only two common ancestors on the cladogram, while Glomerida and Glomeridesmida share three common ancestors.
43	Option D is correct	Molecule X has carbon, hydrogen, and oxygen in a 1:2:1 ratio, which is characteristic of a simple sugar, which is a carbohydrate. Molecule Y contains phosphorous and the nitrogenous bases uracil (U), adenine (A), and guanine (G), which are characteristics of a nucleic acid.
	Option A is incorrect	Molecule Y contains phosphorus, which is not in carbohydrates.
	Option B is incorrect	Molecule X does not contain phosphorus, which is an indicator of nucleic acids.
	Option C is incorrect	Molecule X does not contain phosphorus or a 5-carbon sugar.
44	Option G is correct	The two birds are foraging at different parts of the tree, which reduces competition for food.
	Option F is incorrect	The species use flying as a defense against predation, which is not attributable to foraging behavior.
	Option H is incorrect	Foraging behavior does not prevent birds from interbreeding with each other.
	Option J is incorrect	Foraging behavior does not establish dominance between the birds for nesting sites.
45	Option D is correct	The sugars produced have to be used to meet higher energy demands due to a hotter environment. Plants that live in temperate environments are able to store more sugar due to lower energy demands and are sweeter.
	Option A is incorrect	Chloroplasts are not capable of moving from the leaves to the fruits of a plant.
	Option B is incorrect	Xylem transports water and minerals. Fruit requires nutrients to grow.
	Option C is incorrect	Sugars that could be stored in roots are used to meet energy demands.

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46	Option H is correct	Arrow 1 includes G <sub>1</sub> phase, S phase, and G <sub>2</sub> phase, which are all part of interphase. Arrow 2 includes the phases between G <sub>2</sub> phase and G <sub>1</sub> phase, which is mitosis, also known as M phase.
	Option F is incorrect	Arrow 1 represents interphase, and Arrow 2 represents mitosis.
	Option G is incorrect	Arrow 1 represents interphase, and Arrow 2 represents mitosis.
	Option J is incorrect	Arrow 1 represents interphase, and Arrow 2 represents mitosis.
47	Option B is correct	The carbon dioxide produced from cellular respiration is used by producers in photosynthesis.
	Option A is incorrect	Consumers use oxygen produced by producers. Consumers do not produce oxygen.
	Option C is incorrect	Producers obtain chemical energy through photosynthesis.
	Option D is incorrect	Lactic acid is a by-product of anaerobic respiration (respiration that does not use oxygen) that is not used by producers.
48	Option H is correct	Cells are able to reproduce independently, and viruses require a host cell to reproduce.
	Option F is incorrect	All viruses contain proteins and nucleic acids on the inside.
	Option G is incorrect	Viruses do not have flagella. Cells can have cilia and/or flagella.
	Option J is incorrect	Cells have membranes composed of mostly lipids, with proteins and carbohydrates embedded. Viruses do not have membranes.
49	Option B is correct	Plants produce proteins that can be consumed and broken down by animals into amino acids.
	Option A is incorrect	Nitrogen in the air must be converted to a usable form.
	Option C is incorrect	Water is primarily a source for hydrogen, oxygen, and minerals.
	Option D is incorrect	Waste production can remove some amino acids rather than add them as suggested in the question.
50	Option H is correct	The lungs of the respiratory system are involved in taking in oxygen from the environment and releasing carbon dioxide into the environment. The blood of the circulatory system carries oxygen to cells and carries away carbon dioxide from cells.
	Option F is incorrect	The skeletal and muscular systems primarily work together for movement, not gas exchange.
	Option G is incorrect	The excretory system rids the body of waste materials, such as urine, and the reproductive system allows for the continuation of the species.
	Option J is incorrect	The digestive system controls how the organism gains nutrients from the breakdown of food, and the immune system maintains the health of the organism by destroying harmful germs.
51	Option B is correct	The similarities in structures suggest that each primate shown diverged from a common ancestor.
	Option A is incorrect	Similar structures do not definitively support that the organisms lived in similar environments and have similar structures due to convergent evolution.
	Option C is incorrect	Interbreeding within one's population or species is not an indicator of similarities among different species.
	Option D is incorrect	Diet does not solely determine structural similarities.
52	Option J is correct	The illustration shows the second nucleotide in the DNA template (bottom) strand changing from thymine (T) to adenine (A). A substitution mutation is when one nucleotide base is exchanged for another.
	Option F is incorrect	An insertion mutation inserts an extra base pair into the DNA sequence.
	Option G is incorrect	A deletion mutation deletes a base pair from the DNA sequence.
	Option H is incorrect	A duplication mutation causes additional copies of a section of DNA to be added to the DNA sequence.



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53	Option A is correct	The aphid, bird, and rabbit are all primary consumers. They receive energy from the producers and store energy that is available for secondary consumers.
	Option B is incorrect	The fox is a 2nd-order consumer and not an energy source for other 2nd-order consumers in this food web.
	Option C is incorrect	Berries are not consumers. Berries are producers because they photosynthesize to create sugars to break down in the process of cellular respiration for energy.
	Option D is incorrect	The hawk is a 5th-order consumer and does not provide energy to any 2nd-order consumers in this food web.
54	Option H is correct	The illustration shows the organism level as an individual buffalo, the population level as multiple buffalo living in the same area, and the community level as multiple populations of different organisms living in the same area.
	Option F is incorrect	A population is a group of organisms that belong to the same species, not an individual organism.
	Option G is incorrect	A community is all of the populations of different species that live in the same area, not one species.
	Option J is incorrect	An ecosystem includes all the living and nonliving factors in an area, not an individual organism.