

## 2019 STAAR Biology Rationales

Item#	Rationale	
1	Option D is correct	The new predators are now a new selection factor in the environment, making faster rabbits more fit and adapted to this environment. Through the process of natural selection, faster rabbits will survive this change and pass this trait to their offspring. This increase in the number of faster rabbits in the population will result in increasing the average speed of this population.
	Option A is incorrect	Rabbits do not have the ability to willingly mutate their genes.
	Option B is incorrect	An acquired trait, like building muscle strength, is not genetically based and therefore not passed on to offspring.
	Option C is incorrect	Rabbits do not mate with other species and produce offspring.

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Item#	Rationale	
2	Option H is correct	A community is a group of different species living and interacting together in one location, like in the example given.
	Option F is incorrect	This is an example of two members of the same species interacting.
	Option G is incorrect	This is an example of a group of the same species living together, which is a population and not a community.
	Option J is incorrect	This is an example of two members of the same species interacting.

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Item#	Rationale	
3	Option B is correct	Adenine is bonded to the deoxyribose sugar on its own strand as well as to its complementary nucleotide, thymine, on the complementary strand.
	Option A is incorrect	The nitrogenous base adenine would not bond to another adenine because they are not complementary to each other. Phosphate groups, while part of the nucleotide structure, do not directly bond to the nitrogenous bases; they are attached to the sugar groups along the outside of the DNA molecules.
	Option C is incorrect	Ribose sugar and uracil are both components of RNA; therefore they would not be part of a double-stranded DNA molecule.
	Option D is incorrect	Guanine and cytosine are both nitrogenous bases that would not bond to adenine because they are not complementary to it. Uracil is a nitrogenous base that is a part of RNA and not DNA.

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Item#	Rationale	
4	Option H is correct	A wildfire that burned a large area of forest would eliminate the plants in the area. Plants remove carbon dioxide from the atmosphere during the process of photosynthesis, therefore, the decrease in the number of plants in the area would reduce the amount carbon dioxide removed from the atmosphere by plants.
	Option F is incorrect	The decrease in the number of plants by the wildfire would decrease the amount of sugars and starches available for animals in the area.
	Option G is incorrect	Wildfires do not reduce the availability of fossil fuels for use by industries in the area.
	Option J is incorrect	The wildfire would also eliminate the animals in the area therefore, there would not be an increase in animal respiration.

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Item#	Rationale	
5	Option A is correct	A sneeze is triggered by an allergen in the respiratory tissue of the nose. Antibodies of the immune system trigger the allergic reaction to the allergen. Nerve endings in the nose that signal the sneeze reflex inside the brain are also triggered. The reflex triggers muscles in the head, neck, abdomen, and diaphragm to produce the sneeze.
	Option B is incorrect	The skeletal and circulatory system are not directly triggered during a sneeze.
	Option C is incorrect	The endocrine system, skeletal system, and circulatory system are not directly triggered during a sneeze.
	Option D is incorrect	The lymphatic system and skeletal system are not directly triggered during a sneeze.

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Item#	Rationale	
6	Option G is correct	A prokaryote is a unicellular organism that does not have a nucleus. Cell X is most likely a prokaryote because the students did not view a nucleus in the cell.
	Option F is incorrect	The students viewed a nucleus in Cell W, so it cannot be classified as a prokaryote.
	Option H is incorrect	The students viewed a nucleus in Cell Y, so it cannot be classified as a prokaryote.
	Option J is incorrect	The students viewed a nucleus in Cell Z, so it cannot be classified as a prokaryote.

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Item#	Rationale	
7	Option A is correct	Based on the dichotomous key shown, both the glassy sweeper and squirrelfish have eyes located on either side of their head and are not spotted.
	Option B is incorrect	The spotted eagle ray has eyes located on the top of its head.
	Option C is incorrect	Both the spotted goatfish and bandtail puffer have spots.
	Option D is incorrect	The peacock flounder has eyes located on the top of its head.

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Item#	Rationale	
8	Option G is correct	During the process of protein synthesis, the mRNA strand transcribed will be complementary to the DNA template strand. The base uracil present in the complementary mRNA strand will be paired with adenine instead of the base thymine.
	Option F is incorrect	In the complementary strand of mRNA transcribed, the base uracil does not pair with thymine.
	Option H is incorrect	The mRNA strand transcribed will be complementary, not an exact copy of the DNA template strand.
	Option J is incorrect	The mRNA strand transcribed will be complementary, not an exact copy of the DNA template strand.

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Item#	Rationale	
9	Option C is correct	In the cell cycle, the spindle fibers separate the sister chromatids of chromosomes during anaphase. The chemical colchicine prevents the spindle fibers from forming, which stops mitotic division during metaphase, the step before anaphase.
	Option A is incorrect	Spindle fibers do not form during the $G_0$ or $G_1$ phases of the cell cycle, so they would be unaffected by the chemical colchicine.
	Option B is incorrect	Mitotic division is able to proceed in the stages of mitosis before metaphase, before the function of the spindle fibers is needed for further nuclear division.
	Option D is incorrect	Spindle fibers do not form during the S or $G_2$ phases of the cell cycle, so they would be unaffected by the chemical colchicine.

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Item#	Rationale	
10	Option G is correct	Investigating the ability of the unknown organism to perform photosynthesis would allow students to classify the organism correctly because performing photosynthesis is a characteristic of plants and not fungi.
	Option F is incorrect	Cell walls are a characteristic of both plants and fungi, so investigating this question would not allow students to classify the unknown organism correctly.
	Option H is incorrect	Nervous tissue is a characteristic of neither plants nor fungi, so investigating this question would not allow students to classify the unknown organism correctly.
	Option J is incorrect	Sexual reproduction is a characteristic of some plants and some fungi, so investigating this question would not allow students to classify the unknown organism correctly.

## 2019 STAAR Biology Rationales

Item#	Rationale	
11	Option A is correct	Salamanders are organisms that heavily depend on water to survive, so decreasing the flow of clean water from the spring that feeds the river they inhabit would most likely decrease their ability to survive.
	Option B is incorrect	An effort to reduce the pollution runoff would most likely increase the ability of the salamanders to survive.
	Option C is incorrect	Funding educational programs related to river ecosystem conservation would potentially increase the ability of the salamanders to survive.
	Option D is incorrect	Limiting competition for resources would most likely increase the ability of the salamanders to survive.

## 2019 STAAR Biology Rationales

Item#	Rationale	
12	Option G is correct	The time scale shown in the diagram provides evidence that horses slowly developed over a time period of 60 million years.
	Option F is incorrect	The gradual changes represented in the diagram provide evidence that a new species of horse did not suddenly appear.
	Option H is incorrect	The diagram does not provide any data about the embryological development of horses.
	Option J is incorrect	The diagram does not provide any data about the common ancestry of horses with other hooved animals.

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Item#	Rationale	
13	Option C is correct	The nuclear membrane surrounds the nucleus of animal cells where the genetic material (DNA) is contained. Similarly the capsid surrounds the genetic material (DNA or RNA) of a virus.
	Option A is incorrect	Vesicles are responsible for transporting proteins throughout a cell. Viral proteins make up the outer structure of the virus and therefore are not transported throughout the structure.
	Option B is incorrect	ATP provides the energy for activities in cells. Viruses do not make their own energy.
	Option D is incorrect	The genetic material, not the structure that surrounds it, codes for the proteins needed for reproduction of a cell or a virus.

## 2019 STAAR Biology Rationales

Item#	Rationale	
14	Option G is correct	The three-dimensional shape of the active site on an enzyme is complementary to the substrate of the reaction catalyzed by that enzyme. Changing the complementary shape of the active site will prevent the substrate from binding to the enzyme; therefore, the enzyme will no longer be able to catalyze the reaction with the substrate.
	Option F is incorrect	The substrate is not willingly able to change its shape to match the enzyme.
	Option H is incorrect	The enzyme will no longer be able to catalyze the reaction with the substrate; therefore, no products will be made from the enzyme and substrate.
	Option J is incorrect	The change of shape is not likely to allow the enzyme to bind to more diverse substrates than before, since substrates require a specific fit to the active site of an enzyme.

## 2019 STAAR Biology Rationales

Item#	Rationale	
15	Option A is correct	The type of cellular transport shown in the diagram is best identified as active transport because the arrow indicates that the molecules are moving from an area of low concentration to an area of high concentration (against the concentration gradient) and using energy as indicated by the ATP.
	Option B is incorrect	Facilitated transport is a type of passive transport where molecules are moved from an area of high concentration to an area of low concentration (with the concentration gradient) through a membrane protein.
	Option C is incorrect	Osmosis is the passive transport of water.
	Option D is incorrect	Endocytosis is when molecules are moved into a cell by a vacuole. The molecules shown are moving through a cellular protein and not a vacuole.

## 2019 STAAR Biology Rationales

Item#	Rationale	
16	Option J is correct	Since the aye-aye lemur uses its specialized finger to find the location of and reach for insect larvae, having food sources that are hard to find is the selective pressure that most likely resulted in the development of this special adaptation that aids in finding its prey.
	Option F is incorrect	The aye-aye lemur does not use its specialized finger to find the location of water, so limited availability of water is not the selective pressure that most likely resulted in the development of its specialized adaptation.
	Option G is incorrect	The aye-aye lemur does not use its specialized finger to attract mates, so competing for mates is not the selective pressure that most likely resulted in the development of its specialized adaptation.
	Option H is incorrect	The aye-aye lemur does not use its specialized finger to avoid or defend against predators, so large numbers of natural predators is not the selective pressure that most likely resulted in the development of its specialized adaptation.

## 2019 STAAR Biology Rationales

Item#	Rationale	
17	Option C is correct	The probability of albinism in the offspring of two mice with AaBb alleles is determined by how many are likely to have the 'aa' allele combination. Completing the combinations in the graphic shown, there will be four out of sixteen $\left(\frac{4}{16}\right)$ possible combinations that will have the 'aa' allele combination that will result in albinism in the offspring.
	Option A is incorrect	Crossing two mice with AaBb alleles is predicted to have a probability higher than one out of sixteen combinations for offspring with albinism.
	Option B is incorrect	Crossing two mice with AaBb alleles is predicted to have a probability higher than three out of sixteen combinations for offspring with albinism.
	Option D is incorrect	Crossing two mice with AaBb alleles is predicted to have a probability lower than nine out of sixteen combinations for offspring with albinism.

## 2019 STAAR Biology Rationales

Item#	Rationale	
18	Option G is correct	Gibberellins produced in the root tips of plants are able to stimulate growth in the shoots because they are transported through the vascular tissues to other parts of the plant.
	Option F is incorrect	Gases, not hormones, are absorbed through the stomata.
	Option H is incorrect	Gibberellins becoming concentrated within plant tissues does not allow them to affect other parts of the plant.
	Option J is incorrect	Gibberellins are hormones, not infectious agents.

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Item#	Rationale	
19	Option D is correct	The cellular process that takes place in the mitochondrion is cellular respiration. ATP is the additional molecule that is produced as a result of cellular respiration.
	Option A is incorrect	DNA is not produced through cellular respiration.
	Option B is incorrect	RNA is not produced through cellular respiration.
	Option C is incorrect	Glucose ( $C_6H_{12}O_6$ ) is a reactant, not a product, of cellular respiration.

## 2019 STAAR Biology Rationales

Item#	Rationale	
20	Option G is correct	The populations of ants and grasshoppers, which are the prey of Texas horned lizards, are most likely to increase as a result of a disease reducing the population of lizards.
	Option F is incorrect	Grasses are not the prey of Texas horned lizards, so they are not the most likely population to increase as a result of a reduced lizard population.
	Option H is incorrect	Texas cottomouths are the predators of Texas horned lizards, so they are not the most likely population to increase as a result of a reduced lizard population.
	Option J is incorrect	Texas cottomouths and red-shouldered hawks are the predators of Texas horned lizards, so they are not the most likely populations to increase as a result of a reduced lizard population.

## 2019 STAAR Biology Rationales

Item#	Rationale	
21	Option A is correct	Since organisms at higher trophic levels have less energy available to them than organisms at lower trophic levels, there is less energy that is transferred to higher trophic levels, making a smaller amount of biomass to be supported in the ecosystem.
	Option B is incorrect	Organisms at higher trophic levels generally do not require smaller habitats than organisms at lower trophic levels.
	Option C is incorrect	In this specific biomass pyramid, organisms at lower trophic levels provide more energy than organisms at higher trophic levels.
	Option D is incorrect	Organisms at lower trophic levels generally do not compete for the same resources as organisms at higher trophic levels.

## 2019 STAAR Biology Rationales

Item#	Rationale	
22	Option H is correct	A population with low genetic diversity is highly unlikely to have a type of genetic variation that will enable them to survive changes such as an outbreak of a disease or an environmental change, which then increases their chance of species extinction during such a change.
	Option F is incorrect	Low genetic diversity does not change the mutation rates in a species, and a decreased mutation rate would likely decrease the cheetah survival rate.
	Option G is incorrect	When a population is experiencing genetic drift or natural selection, the gene pool is not in equilibrium.
	Option J is incorrect	The genetic variability in one population does not affect the genetic variability in another unless the populations interbreed.

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Item#	Rationale	
23	Option A is correct	Scientists can use the CRISPR-Cas9 genetic modification technique to control gene expression by activating or deactivating specific genes, which can be done by removing or modifying sections of the DNA sequence of an organism.
	Option B is incorrect	Calculating the number of genes different organisms produce does not allow scientists to control gene expression.
	Option C is incorrect	Identifying how closely related one individual is to another does not allow scientists to control gene expression.
	Option D is incorrect	Determining the number of chromosomes in an organism does not allow scientists to control gene expression.

## 2019 STAAR Biology Rationales

Item#	Rationale	
24	Option J is correct	Decomposing (breaking down dead matter) pioneer plants give way to larger, more complex plant species during the process of secondary succession because the increased amount of soil they provide in the environment provides more area for plants with more extensive root systems to become established.
	Option F is incorrect	The decomposition of pioneer plants increases the amount of soil, not sunlight.
	Option G is incorrect	Soil temperature influences the rate of decomposition, not the other way around.
	Option H is incorrect	The decomposition of pioneer plants adds nutrients to the soil; it does not remove them.

## 2019 STAAR Biology Rationales

Item#	Rationale	
25	Option A is correct	In order for the millipede to flex its back end toward the ant, it must use muscles that are part of the muscular system. The fibers ejected from the tuft are part of the outer protective layer of the millipede, which is part of the integumentary system.
	Option B is incorrect	The millipede is not using its internal defense system to defend against the ants, so the immune system is not directly interacting in this example.
	Option C is incorrect	The millipede is not using hormones to defend against the ants, so the endocrine system is not directly interacting in this example.
	Option D is incorrect	The millipede is not using its internal defense system or hormones to defend against the ants, so the immune and endocrine systems are not directly interacting in this example.

## 2019 STAAR Biology Rationales

Item#	Rationale	
26	Option H is correct	Based on the pedigree shown, individual I-1 has at least one dominant allele (A) because the individual symbol is shaded. Also, because this individual has offspring without the dominant trait, it must also carry a recessive allele (a). Individual I-2 is most likely homozygous recessive (aa) because the individual symbol is not shaded and therefore does not have the dominant trait.
	Option F is incorrect	Individual I-1 is shaded in the pedigree and therefore must have at least one dominant allele (A) to have the trait.
	Option G is incorrect	Individual I-2 is not shaded in the pedigree and therefore does not have a dominant allele (A) to have the trait.
	Option J is incorrect	Individual I-1 is shaded in the pedigree and therefore must have at least one dominant allele (A) to have the trait.

## 2019 STAAR Biology Rationales

Item#	Rationale	
27	Option A is correct	Cells that divide at an accelerated rate form a mass of cells known as a tumor.
	Option B is incorrect	A mass of cells that results from the regulated division of a fertilized cell is known as an embryo.
	Option C is incorrect	A gland is an organ that secretes chemical substances.
	Option D is incorrect	A group of tissues performing the same specific function is known as an organ. The differentiated cells that make up these tissues are made and maintained through regulated cell division.

## 2019 STAAR Biology Rationales

Item#	Rationale	
28	Option G is correct	The model demonstrates an insertion mutation because a sequence of bases is being added to the original gene sequence.
	Option F is incorrect	The model does not demonstrate a deletion mutation because a sequence of bases is not being removed from the original gene sequence.
	Option H is incorrect	The model does not demonstrate a substitution mutation because a sequence of bases is not being exchanged with a sequence of bases from the original gene sequence.
	Option J is incorrect	The model does not demonstrate a translocation mutation because the transfer of part of a chromosome to another chromosome is not shown.

## 2019 STAAR Biology Rationales

Item#	Rationale	
29	Option D is correct	A species is defined as a group of related organisms that share common characteristics and are capable of interbreeding successfully. Because the two populations are unable to interbreed with each other, they must belong to different species.
	Option A is incorrect	Organisms of the same species are always found within the same kingdom.
	Option B is incorrect	All frogs belong to the phylum Chordata.
	Option C is incorrect	All frogs belong to the order Anura.

## 2019 STAAR Biology Rationales

Item#	Rationale	
30	Option G is correct	During strenuous exercise, energy is used at a faster rate in cells. Cells produce more cellular energy through the process of aerobic cellular respiration, which requires oxygen as a reactant. An increased breathing rate would increase oxygen intake in the lungs. The oxygen from the lungs travels to the cells through the circulatory system. An increased heart rate would increase the flow of blood to the cells.
	Option F is incorrect	An increase in water concentration in the blood would not require an increase of oxygen that would result from an increased breathing rate.
	Option H is incorrect	An increased temperature in muscle cells would not require an increase of oxygen that would result from an increased breathing rate.
	Option J is incorrect	Increased muscle activity would decrease glucose levels in the blood.

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Item#	Rationale	
31	Option D is correct	The pathogen responsible for causing hoof-and-mouth disease in livestock is most likely a virus because it requires a host cell to reproduce. Bacteria, fungi, and protists are capable of reproducing without a host cell.
	Option A is incorrect	Viruses, fungi, and protists can be contagious pathogens also.
	Option B is incorrect	Livestock can be infected by viruses, bacteria, and protists also.
	Option C is incorrect	Viruses, protist, and bacteria can be microscopic also.

## 2019 STAAR Biology Rationales

Item#	Rationale	
32	Option F is correct	<i>Glyptapanteles</i> wasp larvae compete with stinkbugs for the same food resource of Geometrid moth caterpillars as shown in the food web. The wasp larvae are a parasite to the geometrid moths because the larvae develop inside the caterpillar form, shown in the life cycle, and prey upon it, as shown in the food web.
	Option G is incorrect	<i>Glyptapanteles</i> wasp larvae are not competing with geometrid moths for the same food resources as shown in the food web.
	Option H is incorrect	<i>Glyptapanteles</i> wasp larvae are not competing with geometrid moths for the same food resources as shown in the food web.
	Option J is incorrect	<i>Glyptapanteles</i> wasp larvae are competing for a food resource with stinkbugs.

## 2019 STAAR Biology Rationales

Item#	Rationale	
33	Option D is correct	There is most likely to be an increase in the number of colorful guppies because the selection pressure of predators has decreased, which favored less colorful guppies.
	Option A is incorrect	The mortality rate of the guppies is most likely to decrease with fewer predators in the area.
	Option B is incorrect	Transferring a guppy population to a new area with fewer predators is not likely to stop the offspring from competing for resources in the environment.
	Option C is incorrect	Transferring a guppy population to a new area with fewer predators is not likely to increase the mutations in the offspring.

## 2019 STAAR Biology Rationales

Item#	Rationale	
34	Option G is correct	Prescribed burns to grassland ecosystems imitate secondary succession since nutrients are returned to the soil and there is greater diversity in plant and animal life in the years after the burn.
	Option F is incorrect	Prescribed burns are not an attempt to imitate biomagnification, a process that increases the concentration of a toxin in organisms higher up in the food chain. Introducing toxins to the environment is not the purpose of prescribed burns.
	Option H is incorrect	Prescribed burns are not an attempt to imitate population bottleneck, a process that causes randomly reduced genetic variation in a population when that population's size is significantly reduced. Reducing genetic variation is not the purpose of prescribed burns.
	Option J is incorrect	Prescribed burns are not an attempt to imitate species extinction. All members that belong to one species are not eliminated since prescribed burns take place in a monitored and controlled area within an ecosystem. Making a species extinct is not the purpose of prescribed burns.

## 2019 STAAR Biology Rationales

Item#	Rationale	
35	Option D is correct	Photosynthesis is the process by which plants convert the energy from sunlight into food; therefore, photosynthesis is directly dependent on the plant's ability to respond to the direction of light.
	Option A is incorrect	Absorption of water and nutrients are not dependent on the plant's ability to respond to the direction of light.
	Option B is incorrect	Seed dispersal and absorption of CO <sub>2</sub> are not dependent on the plant's ability to respond to the direction of light.
	Option C is incorrect	Respiration and food storage are not dependent on the plant's ability to respond to the direction of light.

## 2019 STAAR Biology Rationales

Item#	Rationale	
36	Option G is correct	A mutation that occurs in somatic (body) cells cannot be passed on to an individual's offspring.
	Option F is incorrect	A mutation that occurs in gametic (sex) cells can be passed on to an individual's offspring.
	Option H is incorrect	Recessive mutations can be passed on to an individual's offspring.
	Option J is incorrect	Sex-linked mutations can be passed on to an individual's offspring.

## 2019 STAAR Biology Rationales

Item #	Rationale	
37	Option C is correct	Cytosine and guanine are nitrogenous bases that are part of the genetic code of all living organisms.
	Option A is incorrect	Estrogen and testosterone are hormones present only in vertebrate animals.
	Option B is incorrect	Hemoglobin and lymphocytes are components of the blood only present in animals.
	Option D is incorrect	Cellulose and chlorophyll are components found mainly in plants and not in animals.

## 2019 STAAR Biology Rationales

Item#	Rationale	
38	Option G is correct	Insulin and glucagon are hormones that are part of the endocrine system that are transported through the blood of the circulatory system to the rest of the body.
	Option F is incorrect	Components of the nervous system and reproductive system are not shown to interact in this diagram.
	Option H is incorrect	Components of the reproductive system are not shown to interact in this diagram.
	Option J is incorrect	Components of the immune system are not shown to interact in this diagram.

## 2019 STAAR Biology Rationales

Item#	Rationale	
39	Option C is correct	Protists that decompose dead materials (returning nutrients to the soil) will have the most positive effect on maintaining the plant population in an ecosystem because plants depend on these nutrients to live and grow.
	Option A is incorrect	Protists feeding animals would not have the most positive effect on plant populations.
	Option B is incorrect	Plants produce oxygen also, so this role would not have the most positive effect on plant populations.
	Option D is incorrect	Protists in animals would not have the most positive effect on plant populations.

## 2019 STAAR Biology Rationales

Item#	Rationale	
40	Option F is correct	Glycogen and starch are both energy storage molecules. Cellulose and chitin are both structural components in cells.
	Option G is incorrect	The major functions of cellulose and chitin are as structural components in cells.
	Option H is incorrect	The major function of chitin is as a structural component in cells.
	Option J is incorrect	The major function of cellulose is as a structural component in cells.

## 2019 STAAR Biology Rationales

Item#	Rationale	
41	Option D is correct	Gametes are produced by the process of meiosis, and they only have half of the genetic information of the organism. The combination of genes in each gamete produced is different because the alleles (different forms of a gene) are sorted into different gametes independently of one another (independent assortment) during meiosis.
	Option A is incorrect	An organism produces gametes with different combinations of alleles.
	Option B is incorrect	An organism produces gametes with different combinations of alleles.
	Option C is incorrect	Gametes are produced through the process of meiosis, not mitosis.

## 2019 STAAR Biology Rationales

Item#	Rationale	
42	Option H is correct	Deer are herbivores, so giving birth during the spring and summer, when vegetation is plentiful, ensures that offspring are born when food is most available.
	Option F is incorrect	Male and female deer come into contact all year long.
	Option G is incorrect	Predators are found in deer habitats all year long.
	Option J is incorrect	Some deer are still pregnant during the summer months.

## 2019 STAAR Biology Rationales

Item#	Rationale	
43	Option D is correct	In order for a DNA strand to be complementary, it must follow the DNA base pairing rules: adenine (A) always pairs with thymine (T), and guanine (G) always pairs with cytosine (C). The strand $5'$ TCCAGTCCA $3'$ follows these base pairing rules to be complementary to the strand $3'$ AGGTCAGGT $5'$ .
	Option A is incorrect	The strand $5'$ AGGTCAGGT $3'$ is not complementary to the strand $3'$ AGGTCAGGT $5'$ because it does not follow the DNA base pairing rules.
	Option B is incorrect	The strand $5'$ ACCUGAGGU $3'$ is not complementary to the strand $3'$ AGGTCAGGT $5'$ because it does not follow the DNA base pairing rules.
	Option C is incorrect	The strand $5'$ TGGACTGGGA $3'$ is not complementary to the strand $3'$ AGGTCAGGT $5'$ because it does not follow the DNA base pairing rules.

## 2019 STAAR Biology Rationales

Item#	Rationale	
44	Option F is correct	The copepods harm the sunfish by burying their heads into the sunfish's skin and benefitting from this shelter, so this is an example of parasitism. The seabirds aid the sunfish by removing these parasites and benefit in return from the meal, so this is an example of mutualism. The sunfish prey upon the jellyfish, so this is an example of predation.
	Option G is incorrect	In a parasitic relationship, one organism benefits, and the other organism is harmed. The seabirds are not harming the sunfish, and the sunfish is not harming the seabirds.
	Option H is incorrect	In predation, one organism preys on another. The seabirds are not preying on the sunfish itself, and the sunfish are not preying on the seabirds.
	Option J is incorrect	In a commensalistic relationship, one organism benefits from the other organism, but the organism providing the benefit is neither harmed nor helped by the other. Both the seabirds and sunfish are benefitting from their symbiotic relationship.

## 2019 STAAR Biology Rationales

Item#	Rationale	
45	Option D is correct	Solar energy is needed for the process of photosynthesis to occur. Chemical energy in the form of glucose is needed for the process of cellular respiration to occur.
	Option A is incorrect	Solar energy is needed for photosynthesis to occur, not cellular respiration.
	Option B is incorrect	Chemical energy in the form of glucose is needed for cellular respiration to occur, but not photosynthesis.
	Option C is incorrect	Solar energy is needed for the process of photosynthesis to occur. Chemical energy in the form of glucose is needed for the process of cellular respiration to occur.

## 2019 STAAR Biology Rationales

Item#	Rationale	
46	Option H is correct	During DNA replication the enzyme, DNA polymerase, matches complementary base pairs (adenine to thymine and cytosine to guanine). Two identical DNA double helixes are produced as a result of DNA replication.
	Option F is incorrect	Uracil is a base pair found in RNA, not DNA, so it would not be part of the process of DNA replication.
	Option G is incorrect	Uracil is a base pair found in RNA, not DNA, so it would not be part of the process of DNA replication.
	Option J is incorrect	Uracil is a base pair found in RNA, not DNA, so it would not be part of the process of DNA replication.

## 2019 STAAR Biology Rationales

Item#	Rationale	
47	Option A is correct	Based on the cladogram, hippopotamuses share a more recent common ancestor (as depicted by the nodes on the cladogram) with cows than with javelinas.
	Option B is incorrect	Based on the cladogram, toothed whales share a more recent common ancestor with hippopotamuses than with mouse deer.
	Option C is incorrect	Based on the cladogram, javelinas and pigs are just as closely related as baleen whales and toothed whales.
	Option D is incorrect	Based on the cladogram, cows and mouse deer are just as closely related as javelinas and pigs.

## 2019 STAAR Biology Rationales

Item#	Rationale	
48	Option G is correct	Rolling into a ball when threatened protects the millipede's whole body from predators because it has a hard exoskeleton. Also, secreting noxious chemicals deters predators from eating them.
	Option F is incorrect	Rolling into a ball when threatened and secreting noxious chemicals does not allow the millipede to survive in different temperatures.
	Option H is incorrect	Secreting noxious chemicals does not allow millipedes to conserve different amounts of energy.
	Option J is incorrect	Rolling into a ball when threatened and secreting noxious chemicals does not allow millipedes to blend into different types of environments.

## 2019 STAAR Biology Rationales

Item#	Rationale	
49	Option A is correct	Internal or external stimuli can trigger the activation of specific genes in the DNA of cells, so even though cells or an organisms contain the same genetic materials, they develop into different specialized cell types.
	Option B is incorrect	Random mutations are unlikely to produce the specific differentiated cells that embryonic development requires during a single reproductive event.
	Option C is incorrect	Messenger RNA is not changed into transfer RNA when cell differentiation begins.
	Option D is incorrect	During the cell cycle, chemical signals are not released to link similar genes.

## 2019 STAAR Biology Rationales

Item#	Rationale	
50	Option H is correct	Transmembrane proteins span the width of the cell membrane and help the cell interact with molecules and structures in its external environment as shown in the illustration.
	Option F is incorrect	Some transmembrane proteins help to start, not stop, chemical reactions within the cell.
	Option G is incorrect	Signaling molecules are synthesized in organelles inside the cell.
	Option J is incorrect	Vesicles remove large waste particles from the cytoplasm of the cell.