The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

LIFE SCIENCE: BIOLOGY

Tuesday, June 10, 2025 — 9:15 a.m. to 12:15 p.m., only

Student Name _____

School Name _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

Use your knowledge of **Life Science: Biology** to answer all questions in this examination.

You are to answer all questions in this examination. You may use scrap paper to work out the answers to the questions, but be sure to record your answers on your answer sheet and in your test booklet. A separate answer sheet for multiple-choice questions has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet. Record your answers for the constructed response questions in your test booklet.

All answers in your test booklet should be written in pen, except for graphs and drawings, which should be done in pencil.

When you have completed the examination, you must sign the declaration printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet and test booklet cannot be accepted if you fail to sign this declaration.

NOTICE …

A four-function or scientific calculator must be available for you to use while taking this examination.

Note that diagrams are not drawn to scale unless otherwise noted.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

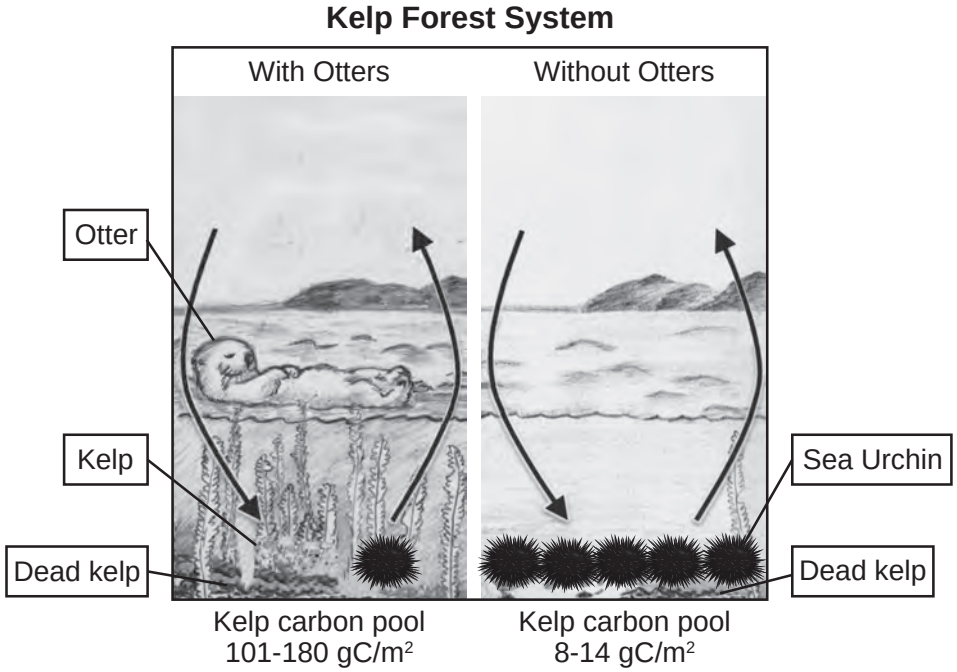
Base your answers to questions 1 through 5 on the information below and on your knowledge of biology.

Carbon! Where Does It Come From? Where Does It Go?

On Earth, carbon compounds are found in the oceans, atmosphere, and living organisms, as well as stored in rocks and sediments. Earth and its atmosphere can be considered a closed system. The amount of carbon in different locations within Earth's system is always changing.

Sea otters help maintain the carbon balance in their ecosystem. Otters eat sea urchins. Eating sea urchins is important, as sea urchins are herbivores that can destroy a kelp forest. Kelp are large autotrophic algae that grow much faster than most plants. When kelp die, they sink into the deep ocean. The low oxygen conditions of the sea floor cause decomposition to be slow or incomplete.

Scientists calculated the carbon pool (how much carbon kelp stores) with and without sea otters, as shown in the model below.



1 Which claim about the kelp carbon pool is best supported by evidence from the information and the model above?

(1) The carbon storage is higher with the otters present because the sea otters eat the sea urchins.

(2) The carbon storage is higher with the sea urchins present because they control the kelp population.

(3) The carbon storage is lower with the otters present because the sea otters eat the kelp.

(4) The carbon storage is lower with the sea urchins present because they carry out autotrophic nutrition.

2 Which statement uses the model to describe how kelp contributes to a reduction of carbon entering the atmosphere?

(1) Kelp produces carbon as it grows within the hydrosphere.

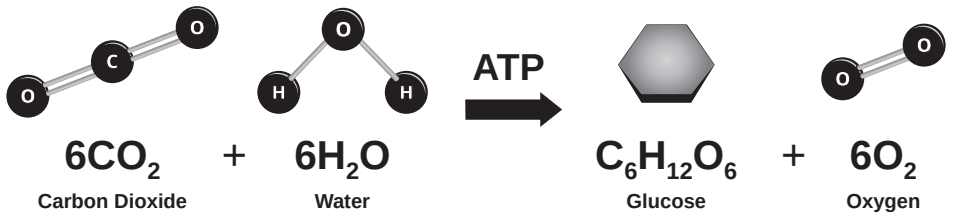
(2) Some of the carbon stored in the dead kelp is trapped in the geosphere of the sea floor.

(3) Kelp produces carbon as it sinks into the hydrosphere.

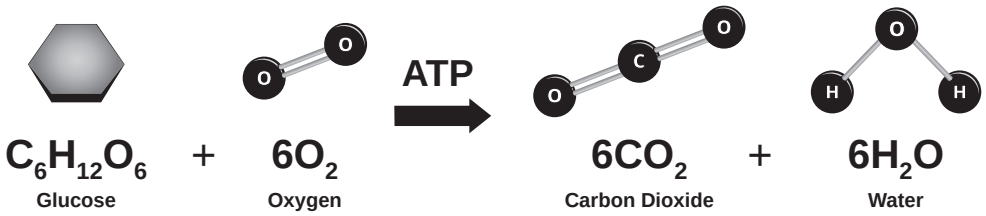
(4) Some of the carbon stored in kelp is added to the geosphere through cell respiration.

3 Which model identifies the process that converts light energy into chemical energy inside the kelp?

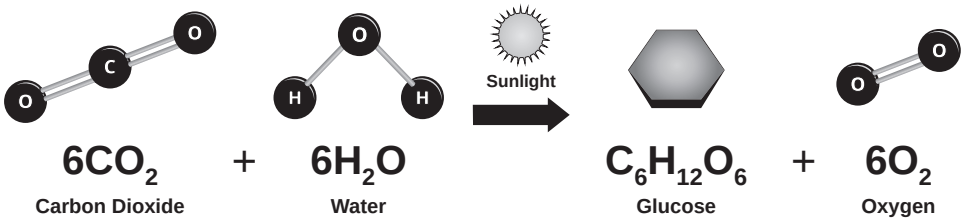
(1)



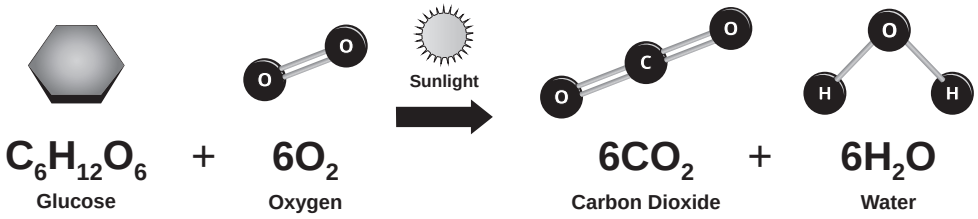
(2)



(3)

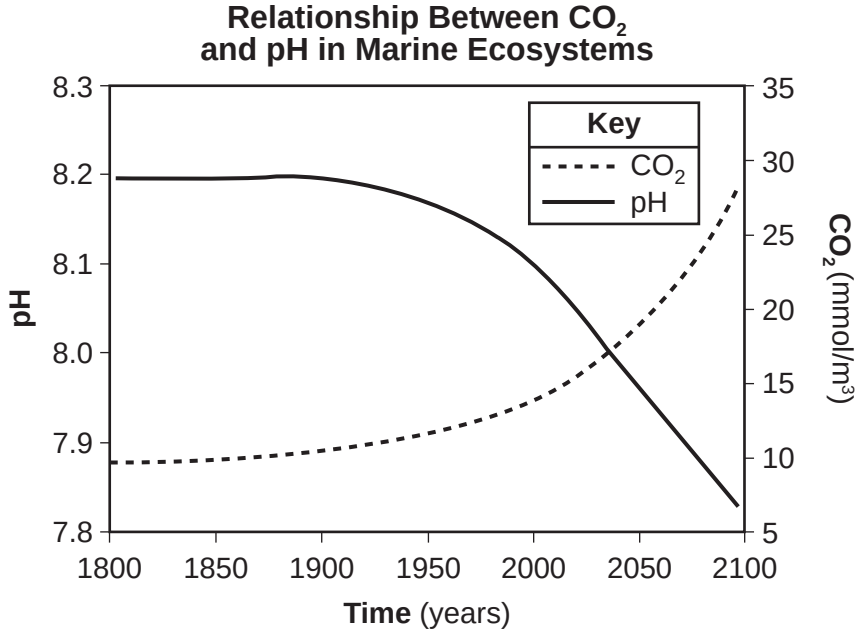


(4)



Increased atmospheric carbon dioxide has been linked to changes within marine ecosystems. When CO_2 combines with water, it produces carbonic acid, lowering the water's pH. A pH of less than 7.8 can interfere with the ability of some marine organisms to make shells and skeletons. These organisms include corals, mussels, plankton, seastars, and sea urchins.

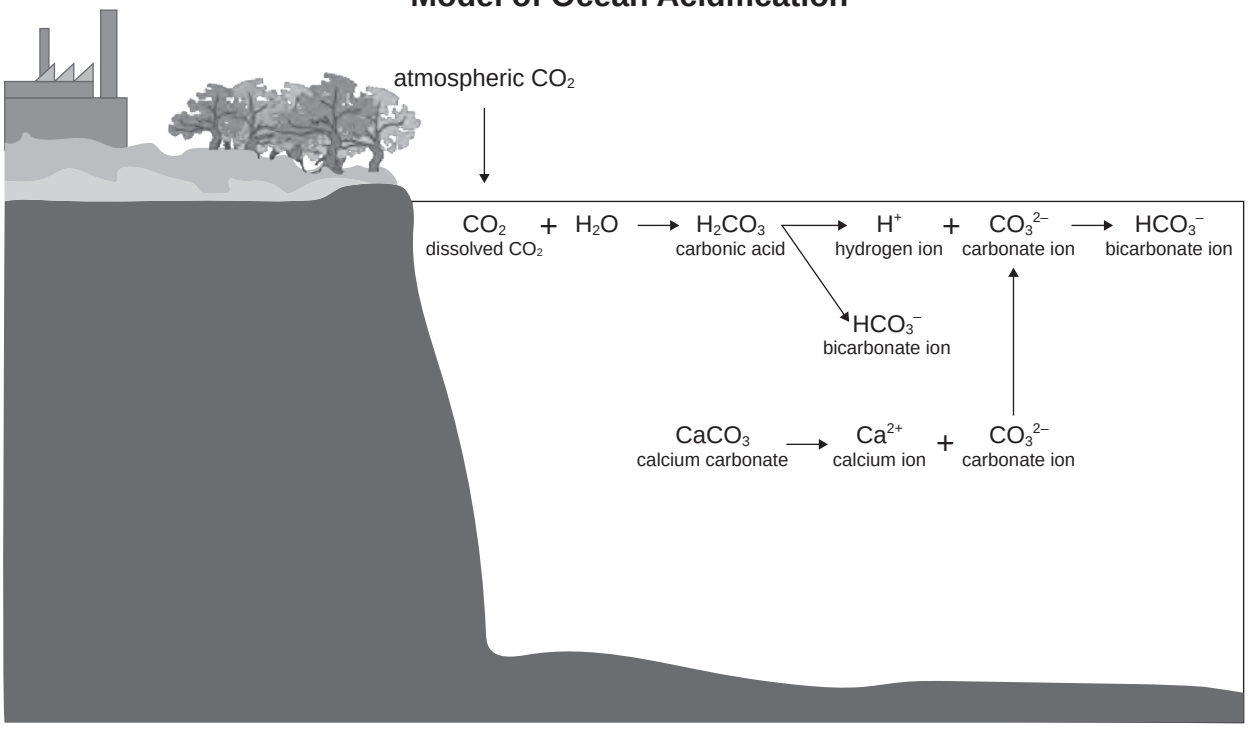
The graph below shows the relationship between atmospheric CO_2 concentration and the pH of seawater.



4 If the trend in atmospheric CO_2 levels continues, sea urchin populations may be impacted. Describe evidence from the graph that supports this claim. [1]

The following diagram shows some information about the cycling of carbon.

Model of Ocean Acidification



(Model not to scale)

The model below shows the equation for how sea urchins make their shells.

$$Ca^{2+} + CO_3^{2-} \rightarrow CaCO_3$$

Calcium ions and carbonate ions produce calcium carbonate.

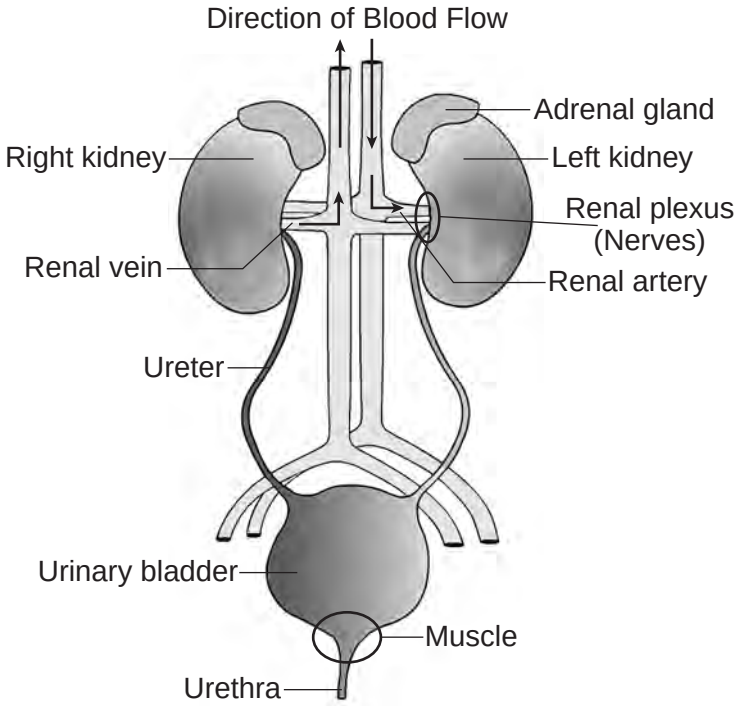
5 As ocean acidification increases, the amount of available carbonate ions decreases. Use the model and information provided to describe how the cycling of carbon between the biosphere *and* at least one other sphere is affected as environmental conditions change. [1]

Base your answers to questions 6 through 10 on the information below and on your knowledge of biology.

Drinking Water Is Just The Beginning!

The amount of water taken in must be in balance with the amount lost. The urinary system is involved in maintaining the salt and water balances within the body.

Human Urinary System



6 Which statement describes how the organization of the urinary system and *one* other system interact to maintain homeostasis in the human body?

(1) The adrenal gland, part of the endocrine system, delivers nutrients to the cells of the urinary system to remove carbon dioxide from the blood.

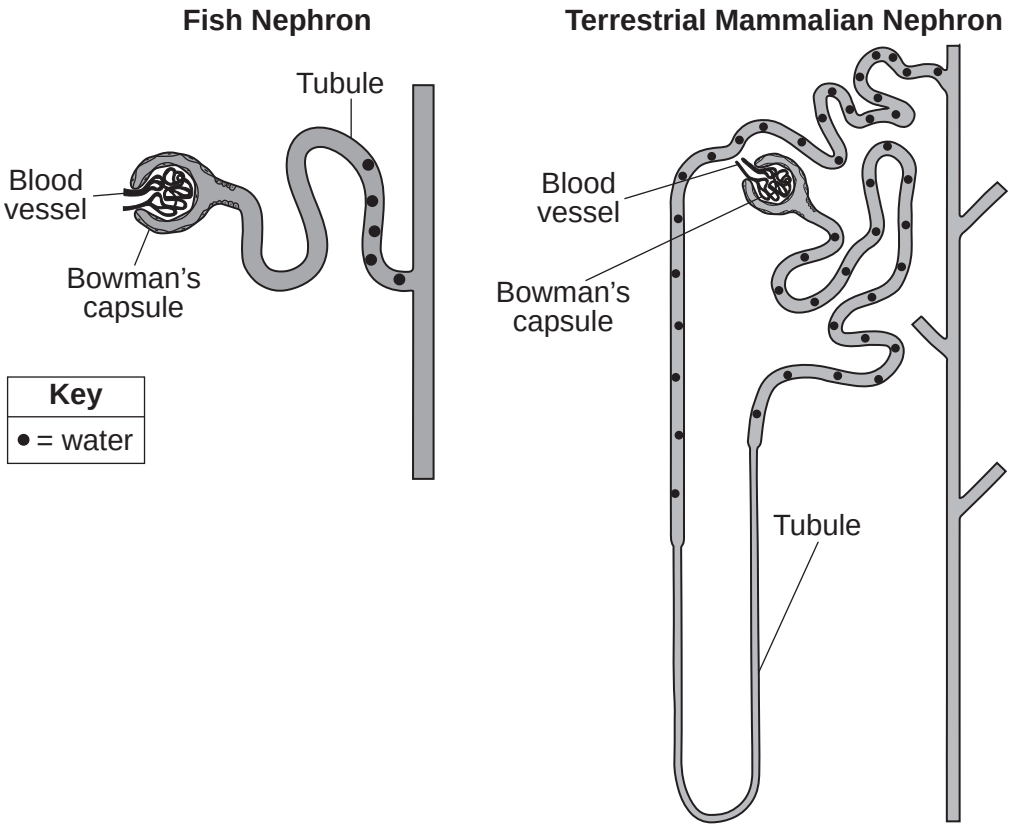
(2) The internal urethral sphincter muscle, part of the muscular system, contracts to signal the cells of the urinary system to regulate blood sugar.

(3) The brain, part of the nervous system, sends messages to the renal plexus (nerves) to signal the cells of the urinary system to deliver oxygen to the blood.

(4) The arteries, part of the circulatory system, deliver unfiltered blood to the cells of the urinary system to remove wastes.

Each kidney is composed of about a million waste-filtering structures known as nephrons. Water is reabsorbed through some parts of the nephron, such as the tubule. The model below shows the structure of a nephron in two organisms.

Nephrons of Various Organisms



7 Based on evidence in the model, which statement explains that natural selection led to the evolution of the nephron's structure and function in terrestrial mammals?

(1) The development of the Bowman's capsule in animal kidneys was more advantageous to mammals than fish.

(2) Nephrons with longer tubules were selected for in organisms that lived on land to conserve the water they drank.

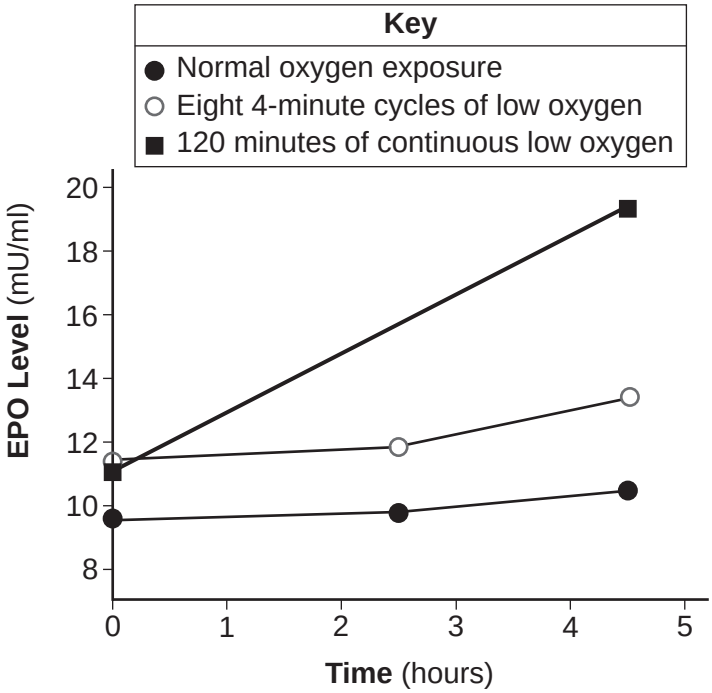
(3) The longer nephron tubule was selected for in animals that lived in oceans, rivers and lakes to filter the excess water absorbed.

(4) The number of nephrons is more important in the evolution of mammals than it is to the evolution of fish.

Another function of the kidney is to aid in regulating the number of red blood cells. The kidneys produce a protein known as Erythropoietin (EPO) that stimulates the increased production of red blood cells.

The graph below shows the results of a study. Participants were exposed to different conditions prior to time zero, then EPO levels were measured over a 4.5-hour time period.

Effect of Oxygen Exposure on EPO Production



8 Using the information provided, describe the evidence to support the claim that exposure to low oxygen levels results in a feedback mechanism that allows the body to maintain homeostasis. [1]

In addition to their other functions, red blood cells (RBCs) have the capacity to carry water. The surface of the cell contains structures called aquaporins, which transport water across cell membranes. Due to their unique cell structure, RBCs are able to expand up to 74% or shrink up to 40% compared to the original cell size.

9 Which statement provides the best explanation for how red blood cells contribute to a feedback mechanism that maintains homeostasis?

(1) The aquaporins in the red blood cells facilitate the exchange of water in environments of different concentrations and help the kidneys more efficiently regulate salt and water balance.

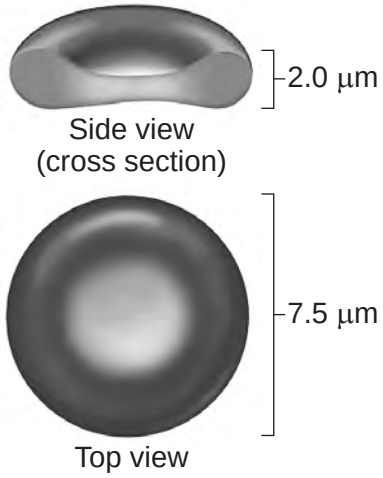
(2) The aquaporins in the red blood cells prevent the exchange of water in environments of different concentrations and help the kidneys more efficiently regulate salt and water balance.

(3) The red blood cells change their shape to move through the kidney but have minimal effect on salt and water balance in the kidneys.

(4) The red blood cells change their shape to move through the kidney but do not regulate any feedback mechanisms.

RBCs typically have a biconcave disk shape. A scientific study examined the effect of changing the RBC shape and membrane flexibility on its ability to transfer oxygen. For this study, when the RBC membrane was less flexible, the oxygen transfer capacity decreased by 18%. When the RBC was more flexible, the oxygen carrying capacity increased by 21%. When RBCs take on water their membrane initially becomes more flexible.

Typical Biconcave Disc Shape of Red Blood Cells



10 What evidence would support the claim that consuming water after exercise helps an athlete's body maintain homeostasis?

	Number of RBCs Taking on Water	RBC Flexibility	Rate of Oxygen Transfer
(1)	increases	decreases	decreases
(2)	increases	increases	increases
(3)	decreases	increases	increases
(4)	decreases	decreases	decreases

Base your answers to questions 11 through 16 on the information below and on your knowledge of biology.

Heads or Tails?

In the mid 1990s, people across several states were finding large numbers of frogs and other amphibians with extra limbs. Possible explanations regarding the cause of these abnormalities ranged from UV radiation, chemical contaminants in the water, parasites, or even airborne substances.

Pacific Chorus Frog with Extra Legs

11 Which question could be asked in order to determine if the abnormalities seen in the frog legs were caused by an inherited mutation?

(1) Do the offspring with an abnormality live in the same environment as the parents?

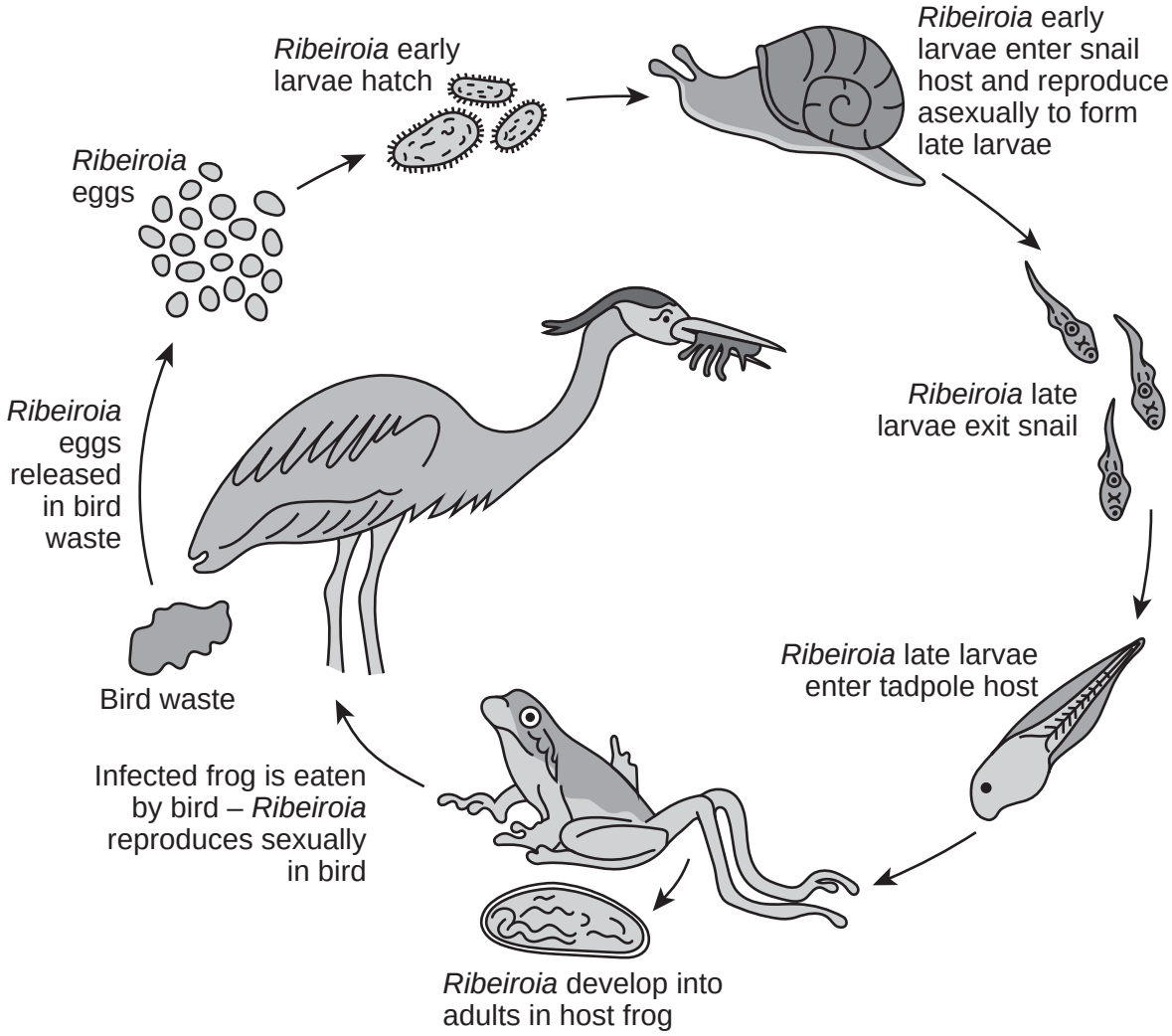
(2) Were the parents exposed to the same environmental factors as some of their offspring?

(3) Is a mutation that causes abnormal legs present in the DNA of the sex cells of the parents?

(4) Do the cells within the legs of the parents contain DNA with a mutation that causes abnormal limbs?

After further research, scientists discovered that these deformities in frogs were not caused by genetic mutations. The actual cause was a parasitic flatworm called *Ribeiroia*. *Ribeiroia* completes a complex life cycle by inhabiting several hosts. This life cycle is summarized in the diagram below.

Ribeiroia Life Cycle



12 A student claims that the *Ribeiroia* parasites that cause the most severe limb abnormalities in frogs have a greater chance of survival and reproduction than those that do not. Which explanation best supports this claim?

(1) The frogs with the most severe limb deformities will be more likely to be caught by birds, allowing the adult *Ribeiroia* to be more likely to survive and reproduce.

(2) The adult *Ribeiroia* will have a greater chance of remaining in the frog to complete all phases of its life cycle, allowing it a better chance to survive and reproduce.

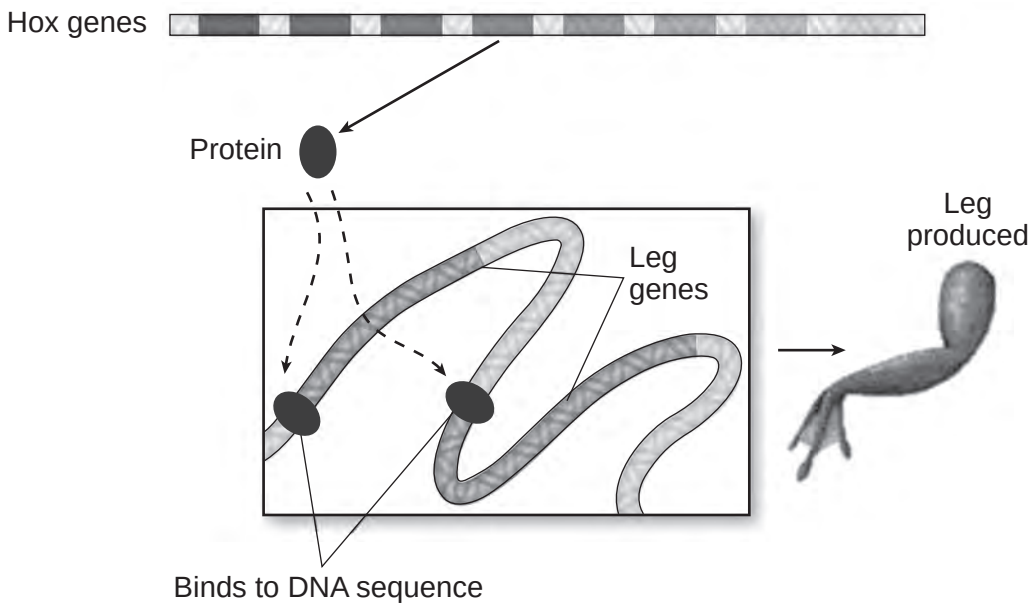
(3) The *Ribeiroia* will have a greater chance of reproducing sexually because it stays in the snail, releasing larvae with this trait back into the water.

(4) The *Ribeiroia* larva will have a greater chance of reproducing asexually and completing its life cycle in the bird.

Hox genes are an important group of regulatory genes that help determine the body plan and head-to-tail orientation of animals in their early stages of development. High concentrations of retinoic acid have been found to influence the activity of Hox genes.

The diagram below shows how proteins produced by the activated Hox genes attach to DNA sequences that act as molecular switches to turn large numbers of different genes on.

Hox Genes Controlling Leg Formation



13 Using the information above, which statement might best explain why the extra limbs grew in parasite-infected frogs?

(1) The Hox genes in the limb caused an increase in the retinoic acid levels which produced proteins that signaled the leg genes to turn off.

(2) The parasites increased the level of retinoic acid in the tadpoles limb, causing Hox genes to transcribe more of the proteins that activated limb formation genes.

(3) The proteins produced by the developing limb signaled the Hox genes to turn on, which increased the retinoic acid levels causing more legs to grow.

(4) The higher retinoic acid levels caused by the parasites turned off the Hox genes in the tadpole limb, signaling the leg formation genes to activate.

Scientists have found that when the *Ribeiroia* parasite enters the frog tadpole, it burrows into the limb bud which develops into the frog's leg. The levels of a chemical called retinoic acid increase rapidly in the limb bud of the tadpoles due to the parasitic infection.

14 Which question could be asked about the effect of retinoic acid levels on inheritance of the observed changes in the frogs?

(1) Do retinoic acid levels affect the inheritance of Hox genes that code for proteins important for leg development?

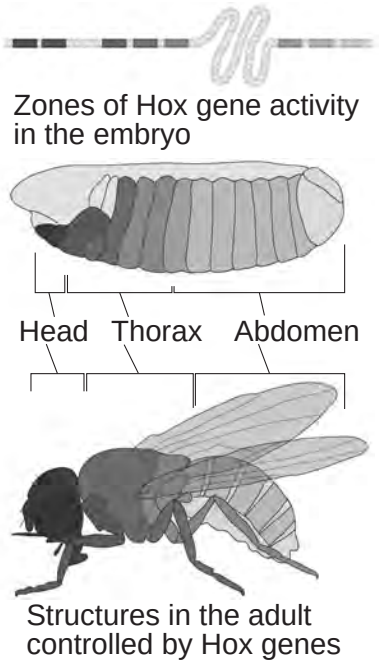
(2) Do retinoic acid levels affect the inheritance of non-coding DNA resulting in a leg?

(3) How do decreased retinoic acid levels influence the inheritance of proteins that code for leg development?

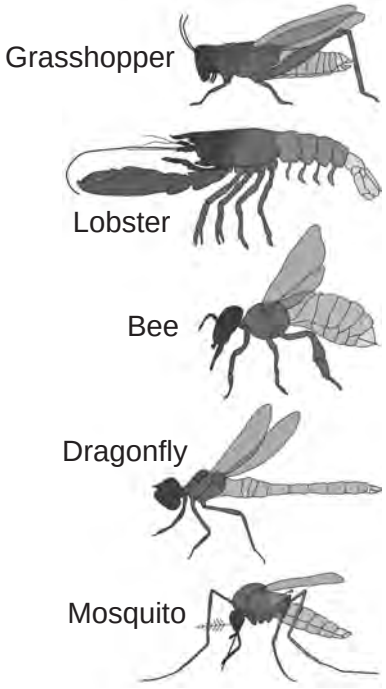
(4) How do increased retinoic acid levels impact the inheritance of non-coding regions of Hox genes?

Hox genes are also found in arthropods. The diagrams below show some information about the Hox genes and body segmentation in a fruit fly. The body plans for other arthropod species are also shown. The differing shades of gray indicate the Hox genes responsible for each body segment's development.

Hox Genes Responsible for Fruit Fly Development



Arthropod Body Plans



15 Describe genetic *and* physical evidence that would support the claim that all of these arthropods share a common ancestor. [1]

Hox genes are also present in mammals and other vertebrates to produce specific body parts in the correct orientation. Specific Hox genes from a mouse and fruit fly can be interchanged.

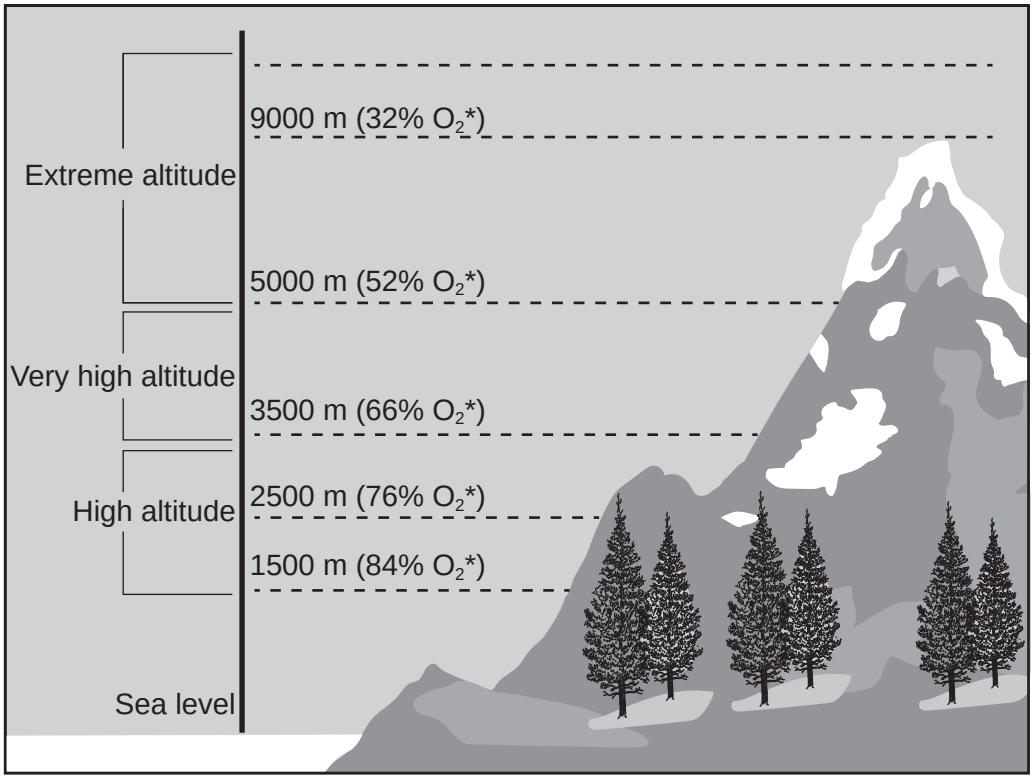
16 Construct an explanation for why typical functioning eyes form in a mouse and a fly when specific Hox genes that activate eye development are interchanged. [1]

Base your answers to questions 17 through 21 on the information below and on your knowledge of biology.

Organisms of the Tibetan Plateau

The yak is an herbivore that lives in the high altitude of the Tibetan Plateau, located in the Himalayan Mountains. They inhabit the Tibetan Plateau at elevations between 3,000 and 5,000 meters. Yaks have a large heart and lungs, as well as a specialized hemoglobin in the cells of their blood that enables them to extract more oxygen from the air.

Concentration of Atmospheric Oxygen Available at Different Altitudes



*Percentage of oxygen (O_2) available at this altitude compared to sea level

17 Using evidence provided, construct an explanation that describes how natural selection has led to the development of an adaptation within yak populations that enable them to survive in their environment. [1]

A gene called EPAS1 is involved in allowing animals to respond to a low oxygen environment. Scientists studied this gene in yaks. They found that yaks having a certain allele of the gene had a greater amount of hemoglobin, which transports oxygen through the body. This allele has a small change in nucleic acid sequence from other alleles of the EPAS1 gene found in yak populations.

18 What is the most likely origin of the change that resulted in this allele?

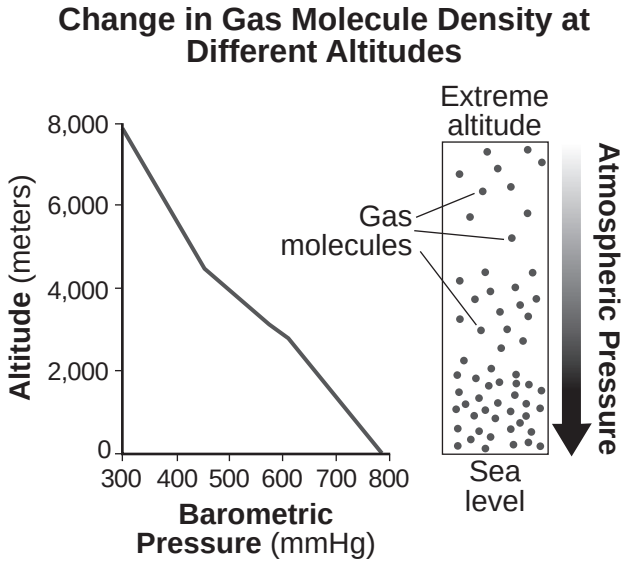
(1) A change in the sequence of the EPAS1 gene occurred during the mitosis of yak blood cells.

(2) The levels of hemoglobin in a yak's blood caused changes to a sequence of the EPAS1 gene.

(3) A change in the sequence of the EPAS1 gene occurred during meiosis of yak gametes.

(4) A yak experienced genetic changes in the EPAS1 gene in response to low oxygen conditions.

Plants that yaks eat grow under stressful conditions. Decreased atmospheric pressure results in changes in the concentrations of gases, as represented below.



19 Which statement best explains why the carrying capacity for producers in extreme-altitude ecosystems is *less* than in sea-level ecosystems?

(1) There is more oxygen available to use for cellular respiration at high altitudes.

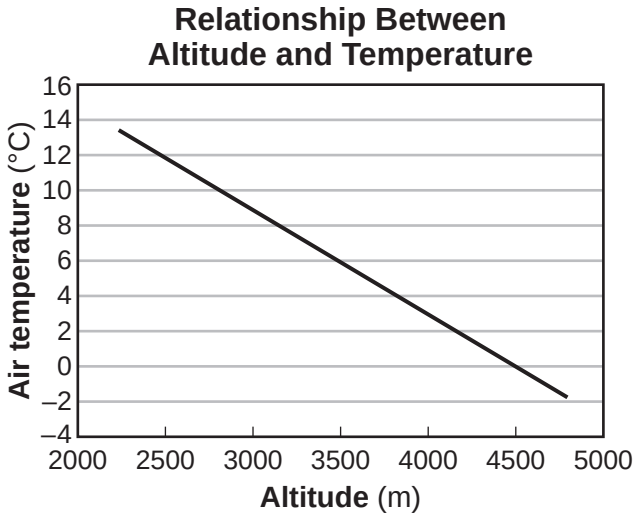
(2) There is less carbon dioxide available to use for photosynthesis at extreme altitudes.

(3) There is increased water vapor available at extreme altitudes which limits the process of photosynthesis.

(4) There is decreased pressure at high altitudes, resulting in faster cellular respiration.

The pika is another herbivorous mammal species that inhabits the Tibetan Plateau. Pika move quickly and spend much of their time foraging for food and keeping a lookout for predators. They are small (5-9 inches long), live in systems of underground tunnels that they dig and maintain, and lack a large heart and large lungs.

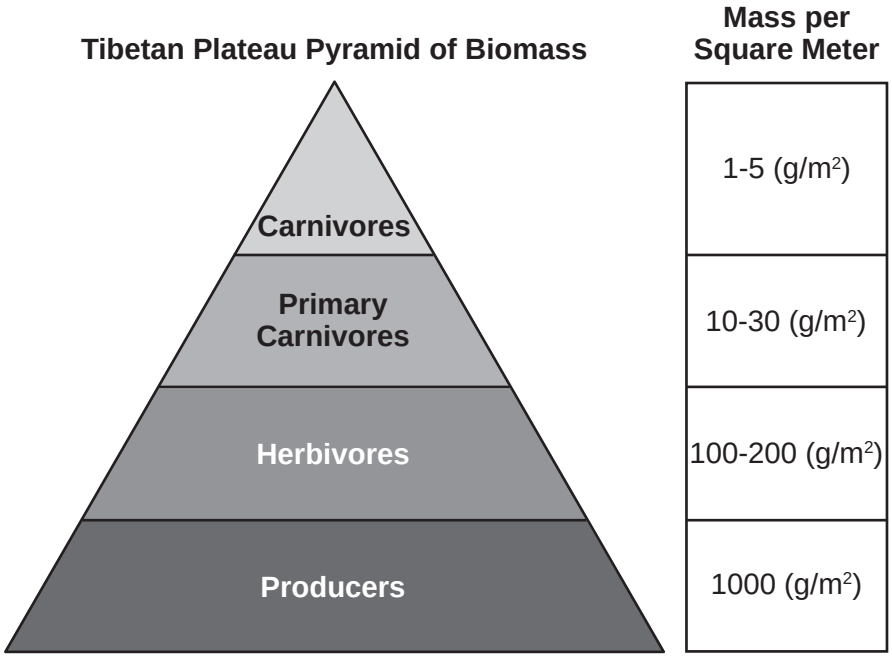
The photograph and graph below show some information about the Tibetan Plateau.



20 Construct an explanation based on evidence that natural selection leads to a behavioral adaptation that pika possess that would help them to survive in the Tibetan ecosystem. [1]

Other organisms that are part of the Tibetan Plateau ecosystem include carnivores such as wolves, eagles, and snow leopards.

The model below shows some approximate biomass at each trophic level of the Tibetan Plateau ecosystem.



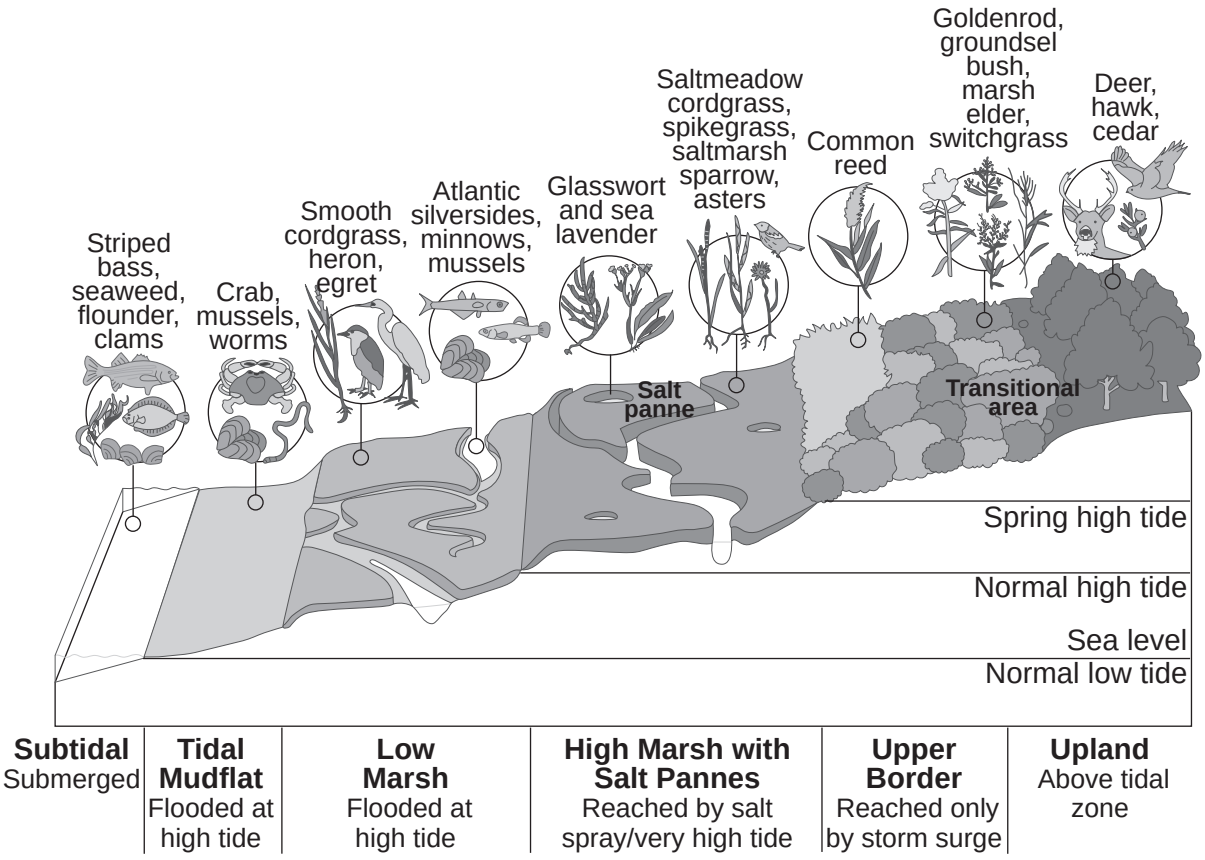
21 Use the evidence provided to make a claim about how energy flow among organisms in the Tibetan Plateau ecosystem affects biomass. [1]

Base your answers to questions 22 through 27 on the information below and on your knowledge of biology.

Salt Marsh Shoreline

Salt marshes are unique ecosystems located along an ocean shoreline, between the ocean itself and dry, upland ecosystems. They are important areas that filter water, protect coastlines, and provide essential habitat. Salt marshes can be affected by tides and weather events. Depending on a variety of factors, salt marshes can contain varied amounts of vegetation, which can influence the biodiversity and function of the salt marsh. The model below shows some information about a typical salt marsh.

Anatomy of a Salt Marsh



22 Which claim best describes the complex interactions that would have the greatest immediate effect on populations of smooth cordgrass in the low salt marsh?

(1) The smooth cordgrass population would be most affected by an influx of saltmarsh sparrows that relocate after severe storms.

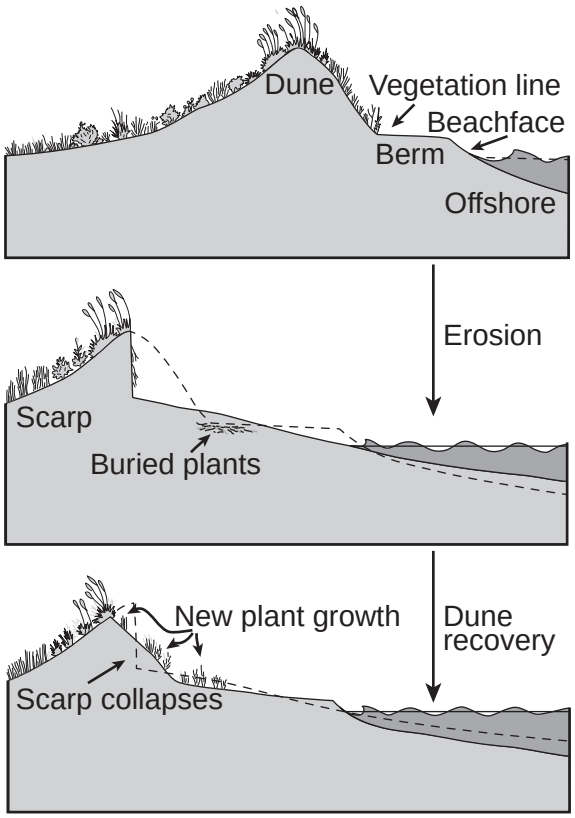
(2) The smooth cordgrass population would be most affected by rising sea levels due to global warming that affects the tide level.

(3) The smooth cordgrass would be most affected by a temporary increase in salinity due to severe storms.

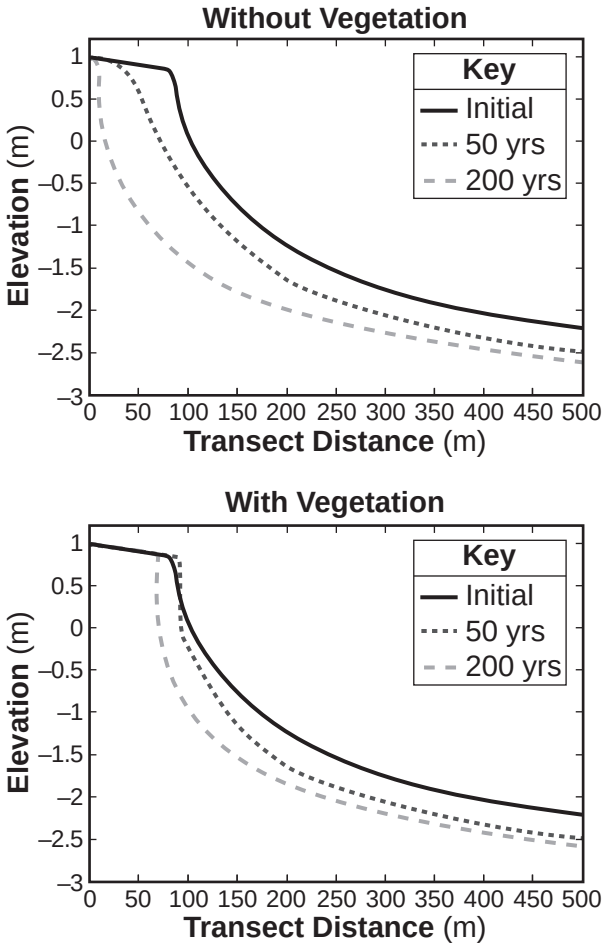
(4) The smooth cordgrass would be most affected by erosion due to severe storms and resulting floods.

Erosion can affect shorelines, including salt marshes. Mathematical models often report shoreline erosion using transect distance. Transect distance measures the same sand dunes along the same line between two specific points. Due to the influence of tides on coastal zones, elevation also affects erosion. The models below show some information about factors that affect shorelines.

Natural Shoreline Recovery



Models of Shoreline Erosion



23 Using the information provided, which statement best describes how natural shoreline erosion affects the habitat's carrying capacity at different scales?

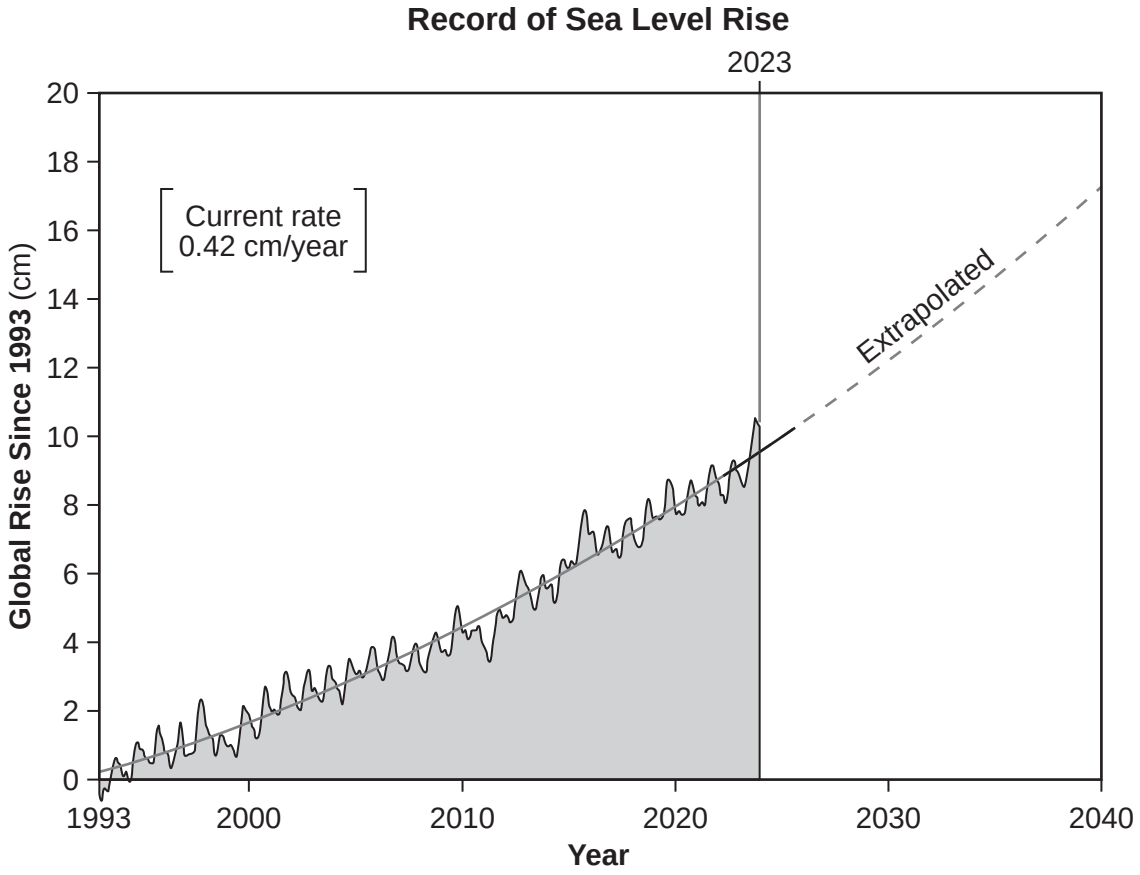
(1) Habitat carrying capacity rapidly decreases in shorelines with vegetation that are affected by erosion.

(2) Habitat carrying capacity rapidly increases in shorelines with vegetation that are affected by erosion.

(3) Habitat carrying capacity rapidly decreases in shorelines without vegetation that are affected by erosion.

(4) Habitat carrying capacity rapidly increases in shorelines without vegetation that are affected by erosion.

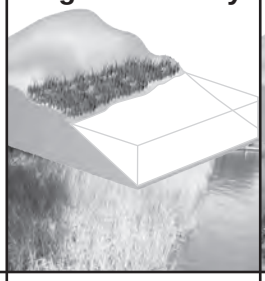
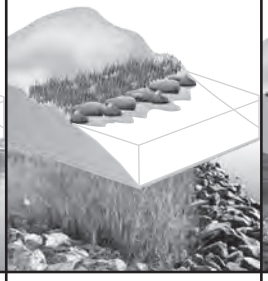
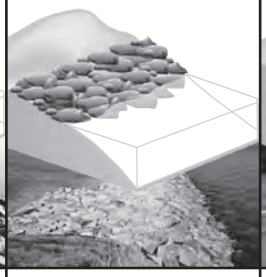
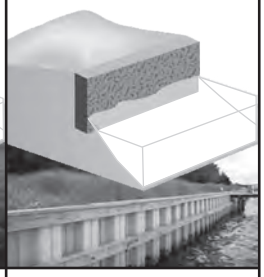
Global climate change may impact salt marshes and other coastal ecosystems. The graph below shows some data collected by NASA using satellites.



24 Using the evidence provided, evaluate the claim that rising sea levels will impact the numbers and types of organisms that interact within a low marsh. [1]

Strategies that mimic the natural surroundings are being developed to reduce erosion and restore shoreline ecosystems. The chart below shows some information about the characteristics of various options for shoreline restoration.

Shoreline Engineering Solutions

	Living Shoreline		Harder Techniques	
Name	**Vegetation Only**	**Sills**	**Revetment**	**Bulkhead**
				
Description	• Roots hold soil in place • Provides buffer. • Breaks small waves	• Natural structures parallel to existing habitat • Reduce wave energy	• Lays over slope of shoreline • Protects shoreline from erosion and waves	• Vertical retaining wall parallel to shoreline • Holds shore in place
Optimal Conditions	Low energy wave environments	Low to moderate wave environments	Sites with preexisting hardened shorelines	High energy wave environments
Material Options	Native plants	Stone and living reef (oyster, mussels)	Stone, rubble, concrete blocks or slabs, sand/ concrete-filled bags	Steel, timber, concrete, carbon fiber
Advantages	• Provides habitat • Slows inland water transfer and stores water • Maintains aquatic/terrestrial connection	• Provides habitat • Slows upland water transfer • Prevents wetland loss • Natural barriers to waves	• Reduces wave action • Low maintenance • May fragment habitat	• Moderates wave action • Reduces tide fluctuations • Prevents natural marsh migration
Disadvantages	• No high water protection • Vegetation may not grow	• No high water protection • Vegetation may not grow	• No major flood or high water protection • Loss of aquatic/ terrestrial connection	• No major flood protection • Loss of aquatic/ terrestrial connection • Decreases fisheries' habitat and diversity
Cost **Initial Construction**	$	$$	$$$$	$$$
Operations & Maintenance Construction	$	$	$$	$$

25 Which type of restoration project would promote the conditions necessary for the development of a stable ecosystem that would support complex interactions between the organisms living there?

(1) The formation of a salt marsh area would allow only one species of water plant to grow in the damaged area.

(2) Build bulkheads so fish and water plants would be held back from shorelines.

(3) Planting vegetation along damaged shorelines would provide shelter for the protection of the shoreline organisms.

(4) The building of a hard structure, such as a revetment, would increase the energy from the waves striking the shoreline.

26 Which claim best describes the complex interactions in a natural living shoreline that are affected by changing conditions, such as a severe storm?

(1) Erosion that occurs during a storm can cause changes to the slope of the land, which exposes high marsh plants to decreased levels of salt, reducing biodiversity.

(2) Oyster reefs can reduce erosion caused by storm waves, which allows salt marshes to expand upland, increasing habitat availability for other organisms.

(3) Bulkheads prevent erosion and increase biodiversity by preventing marsh migration and maintaining the berm during storms.

(4) Severe storms have no impact on the salinity of a salt marsh which causes cordgrass to die, resulting in shorelines that have less vegetation to prevent erosion.

Water levels across the Great Lakes are primarily the result of natural, uncontrolled water supplies into the basin. In June 2019, Lake Ontario experienced record high water levels resulting from heavy rains and storms. Oswego, NY is a city located on the shoreline of Lake Ontario.

Significant damages and other impacts were experienced across the system. Concerns about shoreline loss ranged from loss of revenue from recreational activities in lakeside towns, such as boating, fishing, swimming, and fine dining to property loss for homeowners and businesses. Shoreline communities are seeking reliable ways to reduce property damages and maintain the beach town culture and natural recreational opportunities.

The photograph shows one shoreline in Oswego, NY after the 2019 high water event.

27 Identify the best possible option for shoreline restoration in Oswego, NY from the *Shoreline Engineering Solutions* chart based on the associated cost, reliability, and aesthetics. Evaluate the social and environmental impacts of this solution using those criteria and their trade-offs. [1]

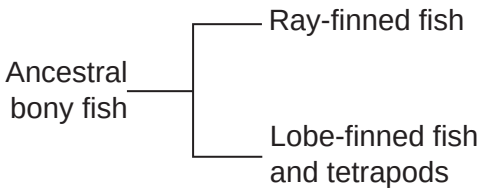
Base your answers to questions 28 through 32 on the information and diagrams below and on your knowledge of biology.

Limb Evolution

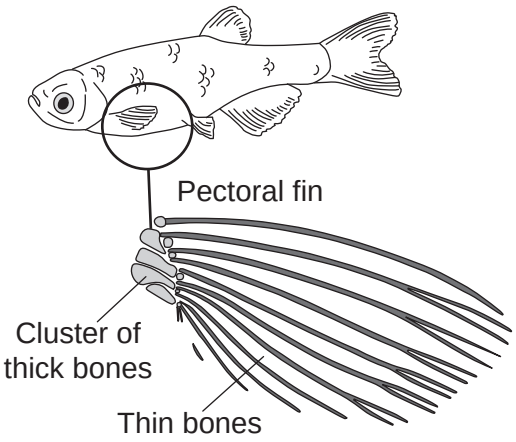
Tetrapods include all animals with backbones that have four limbs that end with digits (fingers and toes). Some tetrapods, such as whales and snakes, do not have four obvious limbs but are included because they have a four-limbed ancestor.

The front limbs of tetrapods are believed to have evolved from the pectoral fins of an ancestral bony fish.

Evolutionary Relationships



Zebrafish
A Modern Ray-Finned Fish



28 What evidence could be used to support the claim that there are patterns in how front limbs evolved in descendants of ancestral bony fish?

(1) documented changes in the habitat of ancestral ray-finned fish that required them to change the number of genes used to produce pectoral fins

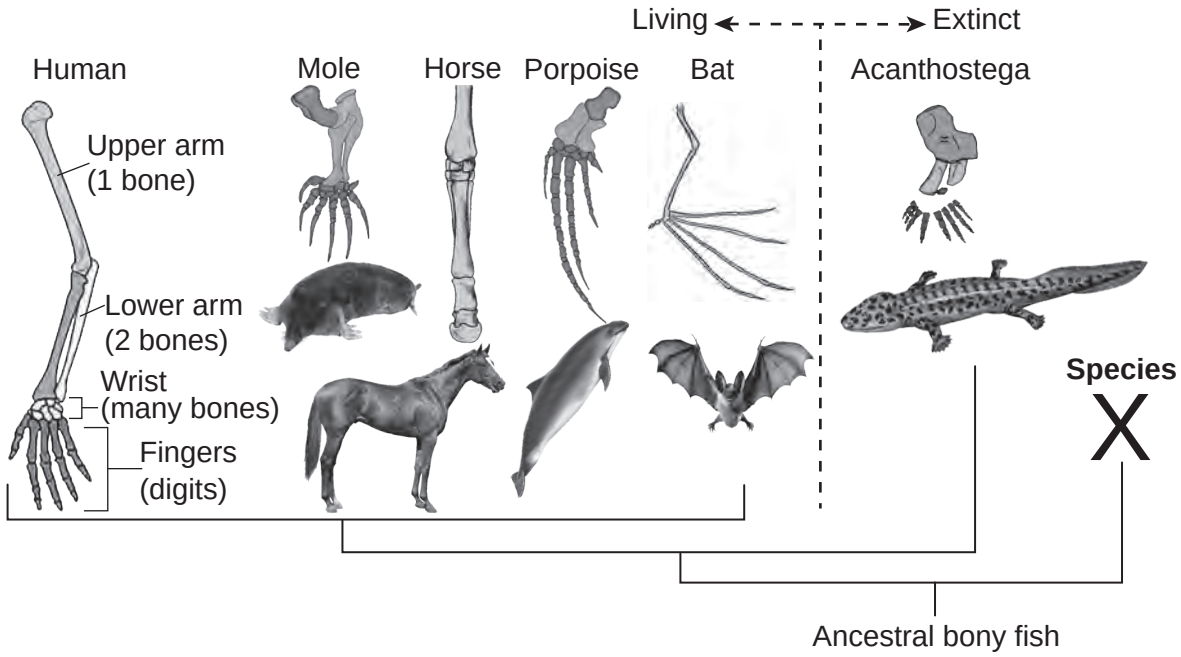
(2) similarities in the base sequence of genes that control the development of pectoral fins in the zebrafish and front limbs in tetrapods

(3) a comparison of the total number of fins on a zebrafish and the total number of limbs present on a tetrapod that is alive today

(4) information regarding how the front limb is used within the environment of the modern-day tetrapod

The diagram summarizes some of the current structural and fossil information regarding front limb evolution in some living animal species and some extinct water-dwelling animal species.

Evolution of Tetrapod Front Limbs



(Not drawn to scale)

29 Which statement below identifies the evolutionary relationships presented in the diagram?

(1) The forelimbs of *Acanthostega* and the living species have a bone structure best suited to life on land, therefore the forelimb of all species evolved from an extinct land-dwelling ancestor.

(2) The extinct, water-dwelling *Acanthostega* and porpoise share the most similar habitat, therefore they share the most recent, extinct common ancestor.

(3) Each of the living species has different forelimb bone structures because they developed different structures in order to evolve within their specific habitats.

(4) The forelimbs of the extinct, water-dwelling species and the living species have a similar arrangement of bones, which provides evidence of common ancestry.

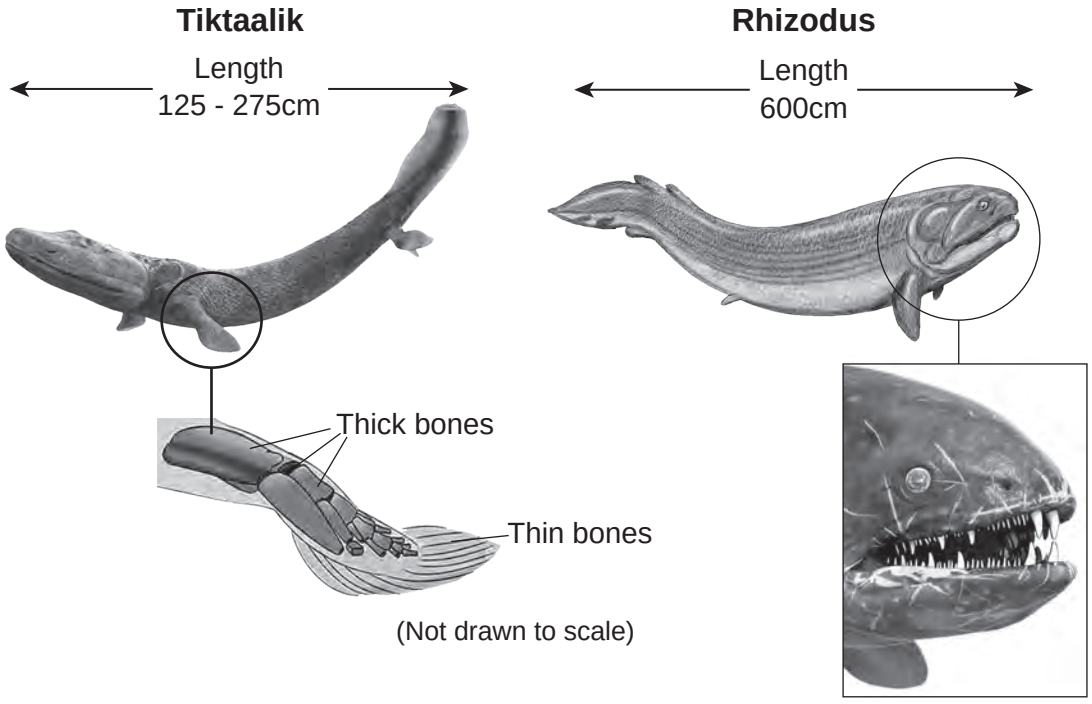
30 Construct an explanation, based on evidence, that the evolution of limb development can be the result of environmental factors. [1]

Scientists are searching for transitional fossils to provide evidence that land-living tetrapods evolved from bony fish. This missing species is represented by Species X on the Evolution of Tetrapods Front Limbs diagram. In 2004, fossilized remains of a possible contender were discovered in Canada. It was named *Tiktaalik*. *Tiktaalik* was a large, fish-like organism that lived about 385 million years ago, when the seas were crowded with many species of fish.

It is believed that *Tiktaalik* lived in shallow, warm water. During this time period the first plants were taking over the land and creeping insects and spiders flourished. *Tiktaalik* could spot prey on the land and in the water using its eyes, located on top of its head. It could also use its very strong front fins to chase and catch prey on the shore. Although it was a large animal, it is likely that *Tiktaalik* was also the prey for even larger predatory fish, such as the gigantic *Rhizodus*, which had two massive fangs located at the front of its jaw.

The diagram below shows some information about possible extinct organisms.

Characteristics of Tiktaalik and Rhizodus



31 Use patterns in the front limb bone structure to support the researcher's claim that *Tiktaalik* represents an ancestral form between ray-finned fish and the early tetrapod, *Acanthostega*. [1]

32 What evidence supports the explanation that animals with traits well-suited to life on land evolved because of the environmental factors present 385 million years ago?

(1) The large body of *Rhizodus* allowed it to move quickly through the shallow water.

(2) The location of *Tiktaalik's* eyes allowed it to see prey in both the land and water.

(3) *Rhizodus* had large fangs which allowed it to function as a predator of *Tiktaalik* both on land and in the water.

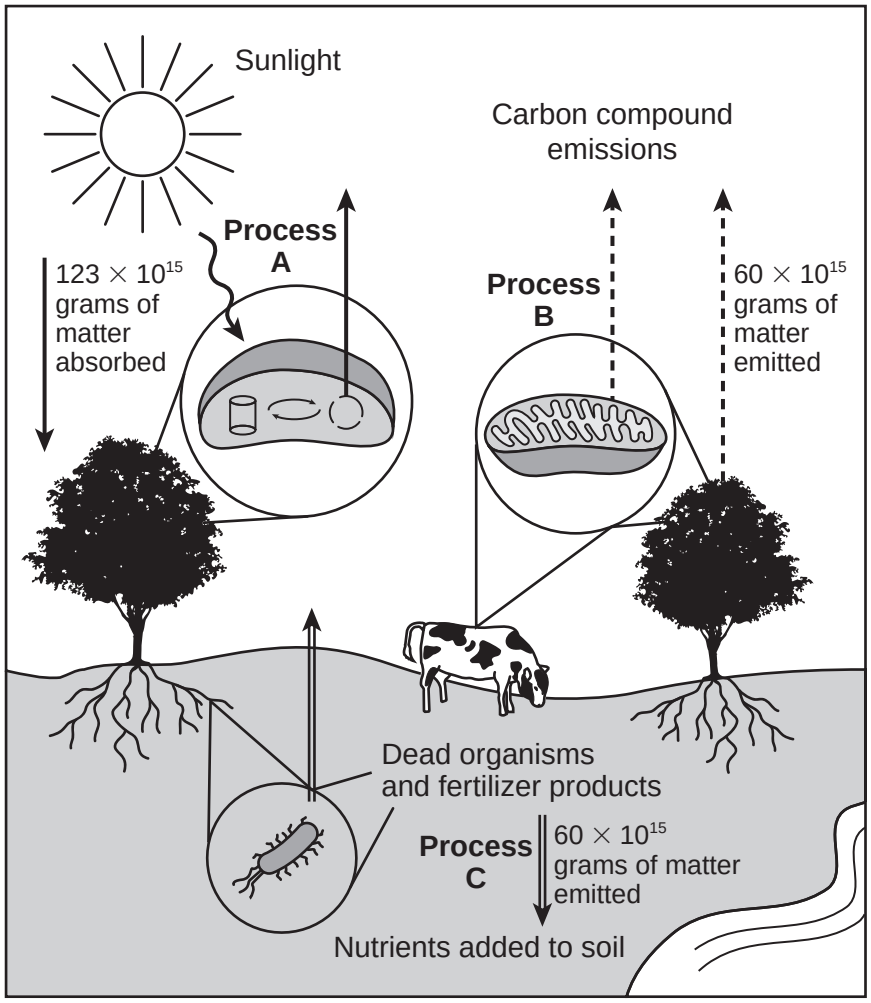
(4) *Tiktaalik* was able to access new food sources and evade predation by *Rhizodus* because the bone structure of its fins enabled it to walk on land.

Base your answers to questions 33 through 37 on the information below and on your knowledge of biology.

Does It Matter?

The carbon used by plants is moved between living organisms, the minerals in the soil, the hydrosphere, and the atmosphere through processes in the carbon cycle.

Matter Conversions



33 Using information from the model, which statement correctly identifies how the movement of matter in this ecosystem provides energy for different organisms?

(1) The plant takes in carbon compounds from the atmosphere, which get converted into sugar and then used by the cow during Process *B* to produce usable energy.

(2) The plant takes in oxygen from the soil, which gets converted into nutrients during Process *B* to produce usable energy.

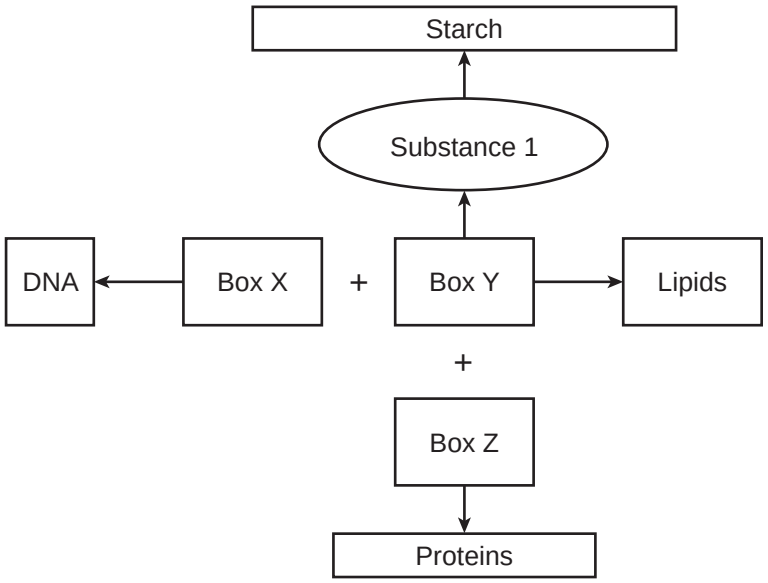
(3) The cow performs Process *C*, which releases sugars into the atmosphere and then is used by plants during Process *A* to produce usable energy.

(4) The cow's wastes are broken down through Process *A*, which releases sugars into the soil and then is used by plants during Process *C* to produce usable energy.

34 Using evidence from the model, construct an explanation for the role of Process *C* in the cycling of matter between living organisms in this ecosystem. [1]

Plants rearrange matter to produce other needed compounds. The model below shows some of the compounds that plants synthesize. Boxes *X*, *Y*, and *Z* represent element(s) used to make these compounds.

How Plants Rearrange Matter



35 Which explanation best supports the claim that elements from Substance 1 in the model combine with different elements to form other carbon-based molecules?

(1) The elements in Box *Y* are broken down into nitrogen and phosphorous and then combined to form lipids.

(2) Substance 1 molecules can be joined together to make starch.

(3) The elements in Box *Y* are combined with nitrogen to make the substances which are used to form proteins.

(4) Substance 1 molecules can be joined together to make DNA.

36 Based on the information in all the models provided, which claim can be made about why Substance 1 is essential for plant metabolism?

(1) Process *B* combines Substance 1 with other elements to form lipids to be utilized by the plant.

(2) Process *A* rearranges elements of carbon, hydrogen, and oxygen to form Substance 1 to be utilized by the plant.

(3) Processes *A* and *C* combine nitrogen and phosphorus with Substance 1 to form proteins utilized by the plant.

(4) Processes *B* and *C* rearrange nitrogen and Substance 1 to form DNA and starches utilized by the plant.

37 Construct an explanation using quantitative evidence for how the cycling of matter in plants results in changes to carbon stored in the atmosphere and biosphere. [1]

Base your answers to questions 38 through 42 on the information below and on your knowledge of biology.

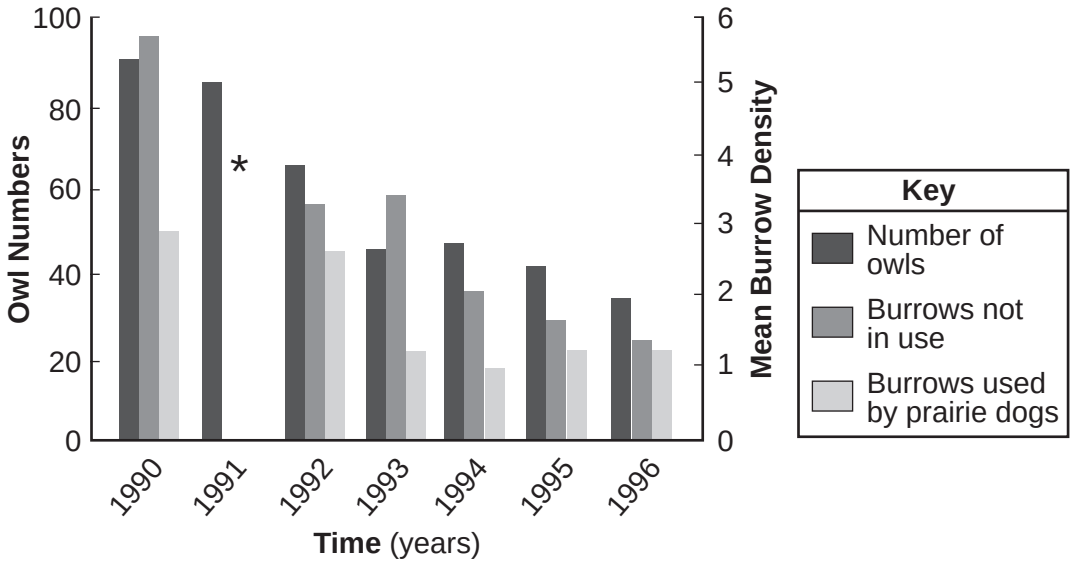
Keystone Species: Black-Tailed Prairie Dogs

The black-tailed prairie dog is a keystone species because it maintains the complex web of relationships in North America's central grassland ecosystems. They feed primarily on plants that are high in moisture and nutrients. As they eat the plants, they drop leaf clippings, which add nutrients to the soil. They construct burrows, which when abandoned can provide homes to rattlesnakes, burrowing owls, and insects. Prairie dogs are the primary prey for many organisms, including the black-footed ferret, one of the rarest and most endangered animals in North America.

The prairie dog population of North America's central grassland is on a steady decline. The most significant threats facing prairie dogs are the conversion of rangeland to cropland, urban development, hunting, and use of poison because they are considered a pest to local farmers and ranchers.

The graph below shows some data collected in a study of 17 prairie dog colonies in Nebraska.

Changes in Average Number of Prairie Dog Burrows and Burrowing Owl Populations in North America



*Complete data not available for 1991.

38 How did the number of prairie dog burrows affect the carrying capacity of burrowing owls in the area?

(1) As the number of prairie dog burrows decreased, the number of burrowing owls the area could support increased.

(2) As the number of burrowing owls increased, the number of prairie dogs the area could support decreased.

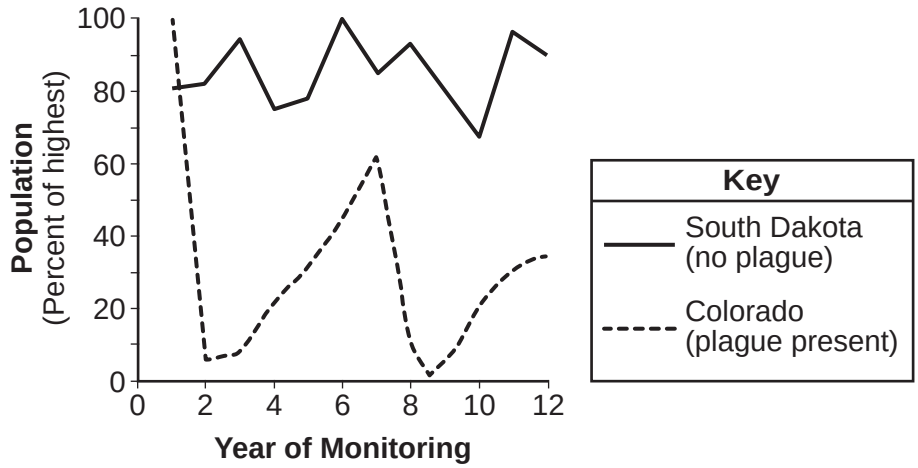
(3) As the number of prairie dog burrows decreased, the number of burrowing owls the area could support decreased.

(4) As the number of burrowing owls increased, the number of total burrows the area could support decreased.

39 Evaluate the claim that a significant decrease in the prairie dog population would have widespread effects by identifying a specific interaction between ecosystem components. [1]

A disease known as the Sylvatic Plague is caused by a bacterium that is carried by fleas on rats. The disease targets small mammals, including the prairie dog. This disease entered the western United States as a consequence of the shipping industry and has been spreading eastward. The graph below shows changes in the prairie dog populations observed in two different states during the 1990s.

Fluctuations in Prairie Dog Populations in North America



40 A claim was made that some of the prairie dogs in Colorado had an advantageous heritable trait that protected them from the plague. Which statement would provide evidence to support this claim?

(1) The prairie dog population increased between years 1 and 2 and years 7 and 8, but then declined because the prairie dogs with the protective variation soon died.

(2) The prairie dog population declined between years 1 and 2 and years 7 and 8, but was able to recover because the prairie dogs with the protective variations survived to reproduce.

(3) The prairie dogs were protected from the plague because the percentage of prairie dogs surviving the plague was always above 60.

(4) Both populations of prairie dogs recovered from plague infections before year 12.

41 The South Dakota prairie dog population shows fluctuation within a range. Which row of the table identifies how different factors affect the carrying capacity?

Row	Factor keeping population from dropping substantially	Factor keeping population from increasing substantially
(1)	Urban development	Number of abandoned burrows
(2)	Depletion of soil nutrients	Reduced rangeland
(3)	Preservation of grassland	Predation by ferrets
(4)	Decreased use of poisons	Increased soil nutrients

Various methods of controlling this plague are being investigated. Two methods that have been found to be effective are described in the table below.

Vaccination	Burrow Dusting
- Oral vaccine given as peanut butter-flavored tablet - Fights off infection for up to 9 months after becoming effective - Tablets must be eaten by the prairie dogs within 7 days of being dropped	- Insecticide powder is sprayed into prairie dog burrows - Kills fleas that carry disease that is transmitted to prairie dogs - Can reduce fleas for up to 2 years beginning immediately after spraying

The location of the study is near residential areas and open ranges that are used to graze cattle and serve as habitats for wild animals. Researchers have been asked to make recommendations regarding which strategy would be the best to use to protect the prairie dog populations from the plague without negatively impacting the nearby areas.

42 Describe the treatment, vaccination or burrow dusting, that will best protect the prairie dogs from the plague while considering the criteria and constraints of cost, safety, *or* reliability. Use specific information from the table to justify your choice of cost, safety, *or* reliability. [1]

Base your answers to questions 43 through 48 on the information below and on your knowledge of biology.

Nature or Nurture?

During one winter in the 20th century, the Netherlands experienced a severe famine (a shortage of food). Some of the women that were in the early stages of pregnancy during the famine gave birth to children that surprisingly had average or even above-average birth weights, considering the poor nutrition of the mothers.

43 Which question would help determine the role of DNA in passing genetic information that influenced birth weight from the mothers during the famine to their children?

(1) Did the genes that play a role in determining birth weight come from both parents?

(2) Did genes made of amino acids come from the DNA of only one parent?

(3) Did genes composed of protein come from the DNA of both parents?

(4) Did the stomach cells of the mother have genes that play a role in birth weight?

Scientists determined that the children whose mothers were in early pregnancy during the famine (children of the famine), had more obesity and chronic health problems in adulthood compared to their siblings that did not have this exposure. The children of the famine had changes in expression of some of their genes. One of these genes, known as IGF2 (insulin-like growth factor 2), codes for a hormone.

The codon chart below can be used to determine the amino acids that are coded for by a DNA sequence.

Codons in mRNA

First Base	Second Base								Third Base
	U		C		A		G		
U	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U
	UUC	Phenylalanine	UCC	Serine	UAC	Tyrosine	UGC	Cysteine	C
	UUA	Leucine	UCA	Serine	UAA	Stop	UGA	Stop	A
	UUG	Leucine	UCG	Serine	UAG	Stop	UGG	Tryptophan	G
C	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U
	CUC	Leucine	CCC	Proline	CAC	Histidine	CGC	Arginine	C
	CUA	Leucine	CCA	Proline	CAA	Glutamine	CGA	Arginine	A
	CUG	Leucine	CCG	Proline	CAG	Glutamine	CGG	Arginine	G
A	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U
	AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	AGC	Serine	C
	AUA	Isoleucine	ACA	Threonine	AAA	Lysine	AGA	Arginine	A
	AUG	Methionine or start	ACG	Threonine	AAG	Lysine	AGG	Arginine	G
G	GUU	Valine	GCU	Alanine	GAU	Aspartic Acid	GGU	Glycine	U
	GUC	Valine	GCC	Alanine	GAC	Aspartic Acid	GGC	Glycine	C
	GUA	Valine	GCA	Alanine	GAA	Glutamic Acid	GGA	Glycine	A
	GUG	Valine	GCG	Alanine	GAG	Glutamic Acid	GGG	Glycine	G

A portion of the IGF2 DNA sequence is included in the table below.

DNA	CTC	CAC	GCT
mRNA	GAG	GUG	CGA
Amino Acid	glutamic acid	valine	arginine

44 A student claimed that changing CTC to CTG in the DNA would result in production of a different protein. Which explanation supports this claim?

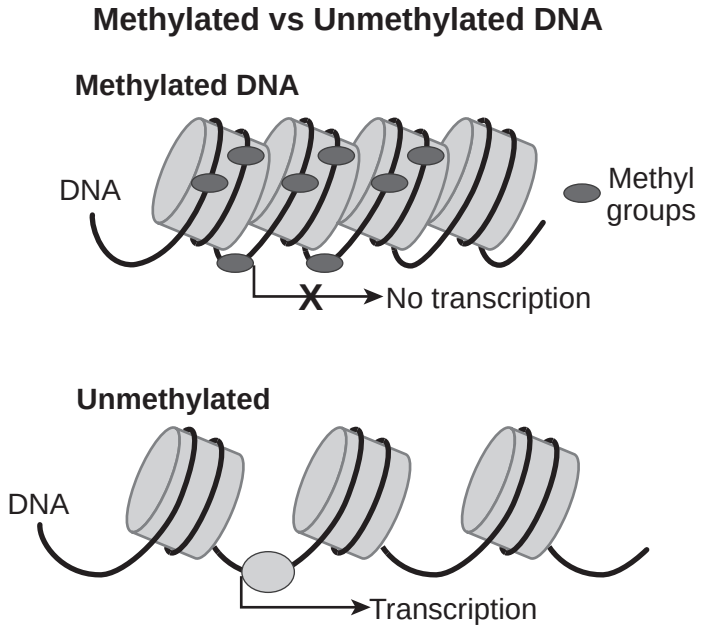
(1) When GAG turns to GAC, aspartic acid is included in the protein instead of glutamic acid.

(2) When GAG turns to GAC, there is no change to the protein produced.

(3) When GAG turns to GAC, the protein would include valine in place of glutamic acid.

(4) When GAG turns to GAC, all of the amino acids that make up the protein would be different.

In a cell, DNA interacts with different molecules. It also interacts with methyl groups in a process known as methylation.



The IGF2 gene codes for a hormone that promotes fetal growth. The children of the famine had less methylation of the IGF2 gene than is typical in other children.

45 Construct an explanation based on evidence for how the structure of unmethylated DNA impacts the function of IGF2, resulting in greater birth weight. [1]

Researchers tracked the health of the children of the famine and their offspring for many years. The research findings showed similar results in their offspring.

46 Which claim is best supported by evidence that their offspring had similar health problems despite a lack of exposure to famine?

(1) Methylation levels of DNA are inherited for only one generation.

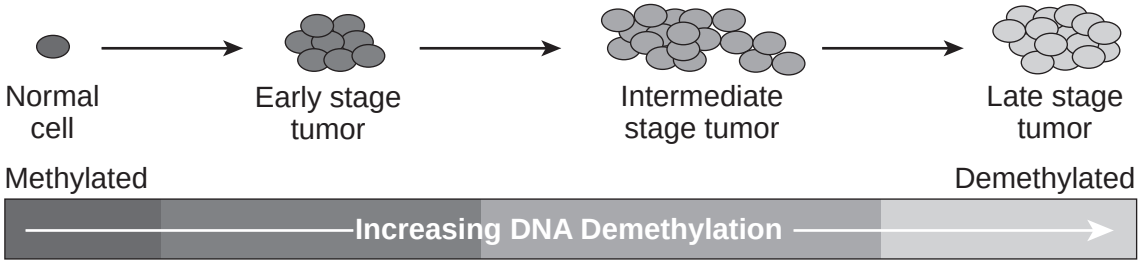
(2) Methylation levels of DNA can be inherited over many generations.

(3) The DNA base sequence is the only factor affecting gene expression.

(4) The DNA base sequence is protected from mutation due to methylation.

Besides famine during pregnancy, other environmental factors such as smoking nicotine can cause demethylation (removal of methyl groups) of portions of DNA responsible for cell division. The result of this demethylation is shown in the model below.

Effects of Demethylation on Lung Cells



47 Using evidence from the model describe how the disruption of the flow of information affects lung cells with demethylated DNA. [1]

48 Which statement identifies a solution that researchers could use to decrease tumor growth and progression?

(1) Use radiation to remove methyl groups from the tumor genes.

(2) Use gene therapy to modify the DNA to accelerate cell division in tumor cells.

(3) Use medication to add methyl groups to the genes that cause an increase in cell division.

(4) Use medication that increases the rate of mitosis in all body cells.

Printed on Recycled Paper

LIFE SCIENCE: BIOLOGY

The State Education Department / The University of the State of New York

Regents Examination in Life Science: Biology – June 2025

Scoring Key: Multiple-Choice Questions

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Life Science: Biology	June '25	**1**	1	MC	1	1
Life Science: Biology	June '25	**2**	2	MC	1	1
Life Science: Biology	June '25	**3**	3	MC	1	1
Life Science: Biology	June '25	**6**	4	MC	1	1
Life Science: Biology	June '25	**7**	2	MC	1	1
Life Science: Biology	June '25	**9**	1	MC	1	1
Life Science: Biology	June '25	**10**	2	MC	1	1
Life Science: Biology	June '25	**11**	3	MC	1	1
Life Science: Biology	June '25	**12**	1	MC	1	1
Life Science: Biology	June '25	**13**	2	MC	1	1
Life Science: Biology	June '25	**14**	1	MC	1	1
Life Science: Biology	June '25	**18**	3	MC	1	1
Life Science: Biology	June '25	**19**	2	MC	1	1
Life Science: Biology	June '25	**22**	4	MC	1	1
Life Science: Biology	June '25	**23**	3	MC	1	1
Life Science: Biology	June '25	**25**	3	MC	1	1
Life Science: Biology	June '25	**26**	2	MC	1	1
Life Science: Biology	June '25	**28**	2	MC	1	1
Life Science: Biology	June '25	**29**	4	MC	1	1
Life Science: Biology	June '25	**32**	4	MC	1	1
Life Science: Biology	June '25	**33**	1	MC	1	1
Life Science: Biology	June '25	**35**	3	MC	1	1
Life Science: Biology	June '25	**36**	2	MC	1	1
Life Science: Biology	June '25	**38**	3	MC	1	1
Life Science: Biology	June '25	**40**	2	MC	1	1
Life Science: Biology	June '25	**41**	3	MC	1	1
Life Science: Biology	June '25	**43**	1	MC	1	1
Life Science: Biology	June '25	**44**	1	MC	1	1
Life Science: Biology	June '25	**46**	2	MC	1	1
Life Science: Biology	June '25	**48**	3	MC	1	1

Regents Examination in Life Science: Biology – June 2025

Scoring Key: Constructed Response Questions

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Life Science: Biology	June '25	**4**	–	CR	1	1
Life Science: Biology	June '25	**5**	–	CR	1	1
Life Science: Biology	June '25	**8**	–	CR	1	1
Life Science: Biology	June '25	**15**	–	CR	1	1
Life Science: Biology	June '25	**16**	–	CR	1	1
Life Science: Biology	June '25	**17**	–	CR	1	1
Life Science: Biology	June '25	**20**	–	CR	1	1
Life Science: Biology	June '25	**21**	–	CR	1	1
Life Science: Biology	June '25	**24**	–	CR	1	1
Life Science: Biology	June '25	**27**	–	CR	1	1
Life Science: Biology	June '25	**30**	–	CR	1	1
Life Science: Biology	June '25	**31**	–	CR	1	1
Life Science: Biology	June '25	**34**	–	CR	1	1
Life Science: Biology	June '25	**37**	–	CR	1	1
Life Science: Biology	June '25	**39**	–	CR	1	1
Life Science: Biology	June '25	**42**	–	CR	1	1
Life Science: Biology	June '25	**45**	–	CR	1	1
Life Science: Biology	June '25	**47**	–	CR	1	1

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2025 Regents Examination in Life Science: Biology** will be posted on the Department's web site at **https://www.nysedregents.org/life_science_biology/** no later than June 26, 2025. Conversion charts provided for the previous administrations of the Living Environment examination must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

LIFE SCIENCE: BIOLOGY

Tuesday, June 10, 2025 — 9:15 a.m. to 12:15 p.m., only

RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 before rating student papers.

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Regents Examination in Life Science: Biology. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences*.

Allow 1 credit for each correct response.

At least two science teachers must participate in the scoring of the open-ended questions on a student's paper. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

Students' responses must be scored strictly according to the Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide. Do not attempt to correct the student's work by making insertions or changes of any kind. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the space provided. The student's score for the Life Science: Biology test should be recorded in the space provided. Then the student's raw score on the test should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations no later than June 26, 2025. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score.

1 [1] Allow 1 credit for 1.

2 [1] Allow 1 credit for 2.

3 [1] Allow 1 credit for 3.

4 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— As CO_2 increases, pH decreases. Less than 7.8 would prevent sea urchins from making skeletons, causing their population to decrease.

— The graph projects that shortly after 2100 ocean pH may be under 7.8, the level at which organisms like sea urchins can't build shells/skeletons.

5 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— As atmospheric CO_2 increases, the carbonate ions in the hydrosphere are used up and the urchins will not have the resources needed to make their shells, reducing the number of urchins in the biosphere.

— As carbonate ions are used to form bicarbonate in the hydrosphere, they are no longer available for sea urchin skeletons in the biosphere.

— Increased CO_2 in the atmosphere causes the oceans in the hydrosphere to be more acidic from carbonic acid. The decrease in pH affects the organisms in the biosphere that need a certain pH range to survive.

6 [1] Allow 1 credit for 4.

7 [1] Allow 1 credit for 2.

8 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— When participants were exposed to 120 minutes of low oxygen, their EPO levels increased from about 11 m/u/ml to 19 m/u/ml over 4.5 hours. More red blood cells make it possible to transport more oxygen until the appropriate blood oxygen level (set point) is reached.

— When there is a decrease in the amount of oxygen the blood is carrying to the kidney, the cells of the kidney release the EPO protein, which causes an increase in red blood cell production. This causes oxygen levels to increase back to normal.

— The graph shows that the longer a person is exposed to low oxygen levels, the more EPO is released. More red blood cells are produced to carry more oxygen until the normal oxygen level is reached.

9 [1] Allow 1 credit for 1.

10 [1] Allow 1 credit for 2.

11 [1] Allow 1 credit for 3.

12 [1] Allow 1 credit for 1.

13 [1] Allow 1 credit for 2.

14 [1] Allow 1 credit for 1.

15 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— They came from a similar ancestry because they all have similar Hox genes resulting in similar segmentation.

— The head (or thorax, or abdomen) in all organisms is coded for by the same Hox gene.

— The Hox gene makes the body plan follow the head, thorax, abdomen pattern.

16 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The Hox genes are the same and are interchangeable because their DNA is the same, producing the right proteins to turn on the correct genes in the given animal.

— The Hox genes are so similar that they will switch on the correct genes for producing eyes in either animal.

17 [1] Allow 1 credit. Acceptable answers include, but are not limited to:

— Yaks with large hearts that pump more oxygenated blood to the cells were better able to survive and reproduce in high altitudes.

— Yaks that have small lungs and are less able to take in oxygen are more likely to die and less likely to pass on their traits.

— Yaks with specialized hemoglobin that can extract more oxygen from the air can survive in high-altitude environments. Since the altitude between 3000 and 5000m above sea level has only 52% to 66% of the normal amount of oxygen, they are better adapted to this environment. They will pass on this trait to offspring.

18 [1] Allow 1 credit for 3.

19 [1] Allow 1 credit for 2.

20 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— At altitudes of 3500 m and above, where the pika lives, temperatures are less than 6°C, so living underground would help them survive.

— They live in tunnels/burrows that protect them from the extreme cold of the Tibetan Plateau.

— The faster-moving pikas can quickly escape predators by running into tunnels.

21 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— There is a 800-900 g/m^2 (90%) reduction in biomass between the level that the pika and yak are at and the level of what they eat. This shows that the energy is lost as it flows up the trophic levels.

— Carnivores at the top level of the pyramid have less biomass than the herbivores that they prey on because energy is lost to heat as you move up trophic levels.

22 [1] Allow 1 credit for 4.

23 [1] Allow 1 credit for 3.

24 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The claim is valid. As sea levels continue to rise, crabs and mussels will move into the low marsh area, which will provide more food for herons and egrets, so their population will increase.

— Rising sea levels may cause the mudflat to move into the low marsh, which could decrease the habitat availability for minnows and silversides. This could decrease populations of heron and egret because of food shortage. This supports the claim that organisms will be impacted.

25 [1] Allow 1 credit for 3.

26 [1] Allow 1 credit for 2.

27 [1] Allow 1 credit. Answers must include:

- The name of a solution from the chart.
- A discussion of cost, reliability, and aesthetics.
- A discussion of social and environmental impacts.

Acceptable responses include, but are not limited to:

— Bulkheads have a higher initial price but lower maintenance costs and are a permanent and reliable solution to environmental concerns of shoreline loss. They are set back from the water, so social and recreational activities could continue without the aesthetics being affected.

— Because the community is focused on the social and recreational value of the shoreline, the revetment would be the best aesthetic option to restore the shoreline because it looks natural. The revetment also is the most reliable option and is cheaper to maintain. However, it does not protect against floods and has the highest cost.

— The best solution for Oswego is to install sills because they are not too expensive to construct, have low maintenance, and look more natural than some other options. Sills do not prevent the flooding of businesses but they do slow down water rise while providing habitat for organisms and protecting wetlands.

28 [1] Allow 1 credit for 2.

29 [1] Allow 1 credit for 4.

30 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Random changes in the genes for limb development provided variation for the process of natural selection to act on. Different limb variations will be selected for or against based on the habitat the organism lives in. The mole and the porpoise have similar bone structures, but are both well adapted to their environment. Organisms with beneficial variations will pass them on.

— When the environment changes, those organisms that are better able to survive will reproduce and pass on their genes to the next generation. Over time this would lead to limb development in the population that is well suited to the new environment.

31 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The fins of *Tiktaalik* have both thin bones, like ray-finned fish, and thick bones, like *Acanthostega*.

— *Tiktaalik* has thick bones close to its body with thin bones toward the tips of the pectoral fins.

— Some bone structures of *Tiktaalik* are similar to both the zebrafish and *Acanthostega*.

32 [1] Allow 1 credit for 4.

33 [1] Allow 1 credit for 1.

34 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— According to the model, matter from living organisms is returned to the soil, where it can be used by plants through the process of decomposition.

— Process *C* makes nutrients available to plants when organisms die/eliminate waste.

— When organisms die, bacteria use the matter to carry out their life processes.

— Process *C* releases carbon dioxide into the atmosphere as dead organisms and fertilizer products are broken down.

35 [1] Allow 1 credit for 3.

36 [1] Allow 1 credit for 2.

37 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Since plants absorb 123×10^{15} grams of matter but only emit 60×10^{15} grams of matter overall, they move matter from the atmosphere to the biosphere.

— Plants absorb 60×10^{15} more grams of matter into the biosphere than they release into the atmosphere.

38 [1] Allow 1 credit for 3.

39 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The claim is valid because the prairie dogs interact with many other species. If the prairie dog population decreased, there would be less food available for black footed ferrets. As the ferrets are already endangered, this could mean the loss of this species and a direct decrease in biodiversity.

— Prairie dog burrows are used by owls/rattlesnakes/insects, so a decrease in prairie dog population would cause a decrease in the number of burrows available. This claim is valid because there would be fewer burrows/homes for many other organisms.

— This claim is supported because without prairie dogs dropping clippings, the soil would be lower in nutrients, which would dramatically alter the ecosystem.

40 [1] Allow 1 credit for 2.

41 [1] Allow 1 credit for 3.

42 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Because burrow dusting is effective at reducing fleas for up to two years, the prairie dogs will be protected from the plague at a lower cost than the vaccine, which fights infection for only nine months.

— Burrow dusting would be the safest method because the insecticide powder is applied to underground burrows, where it should not affect the cattle living on the range.

— Vaccination will be the most reliable method because prairie dogs will seek out the good-tasting tablets. Burrow dusting would be less reliable because workers might miss some burrows.

43 [1] Allow 1 credit for 1.

44 [1] Allow 1 credit for 1.

45 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Unmethylated DNA results in increased transcription of the IGF2 gene. This promotes the production of the growth hormone and increases fetal birth weight.

— More IDF2 is transcribed when DNA is unmethylated, so more growth hormone is made.

46 [1] Allow 1 credit for 2.

47 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Smoking can lead to demethylation, which increases cell division and may form tumors.

— Smoking can increase the risk of cancer by demethylating the DNA, causing cells to divide abnormally.

48 [1] Allow 1 credit for 3.

The *Chart for Determining the Final Examination Score for the June 2025 Regents Examination in Life Science: Biology* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations no later than June 26, 2025.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.
2. Click Regents Examinations.
3. Complete the required demographic fields.
4. Select the test title from the Regents Examination dropdown list.
5. Complete each evaluation question and provide comments in the space provided.
6. Click the SUBMIT button at the bottom of the page to submit the completed form.

THE STATE EDUCATION DEPARTMENT

THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

June 2025 Life Science: Biology Test Map to the Standards

Question	Type	Points	Performance Expectation
1	Multiple Choice	1	HS-LS2-4
2	Multiple Choice	1	HS-LS2-5
3	Multiple Choice	1	HS-LS1-5
4	Constructed Response	1	HS-LS2-2
5	Constructed Response	1	HS-ESS 2-6
6	Multiple Choice	1	HS-LS1-2
7	Multiple Choice	1	HS-LS4-2
8	Constructed Response	1	HS-LS1-3
9	Multiple Choice	1	HS-LS1-3
10	Multiple Choice	1	HS-LS1-3
11	Multiple Choice	1	HS-LS3-1
12	Multiple Choice	1	HS-LS4-2
13	Multiple Choice	1	HS-LS1-1
14	Multiple Choice	1	HS-LS3-1
15	Constructed Response	1	HS-LS4-1
16	Constructed Response	1	HS-LS1-1
17	Constructed Response	1	HS-LS4-4
18	Multiple Choice	1	HS-LS3-2
19	Multiple Choice	1	HS-LS2-1
20	Constructed Response	1	HS-LS4-4
21	Constructed Response	1	HS-LS2-4
22	Multiple Choice	1	HS-LS2-6
23	Multiple Choice	1	HS-LS2-1
24	Constructed Response	1	HS-LS2-6
25	Multiple Choice	1	HS-ETS1-3
26	Multiple Choice	1	HS-LS2-6
27	Constructed Response	1	HS-ETS1-3
28	Multiple Choice	1	HS-LS4-1
29	Multiple Choice	1	HS-LS4-1
30	Constructed Response	1	HS-LS4-2
31	Constructed Response	1	HS-LS4-1
32	Multiple Choice	1	HS-LS4-2
33	Multiple Choice	1	HS-LS1-7
34	Constructed Response	1	HS-LS2-3
35	Multiple Choice	1	HS-LS1-6
36	Multiple Choice	1	HS-LS1-6
37	Constructed Response	1	HS-ESS2-6
38	Multiple Choice	1	HS-LS2-1
39	Constructed Response	1	HS-LS2-6
40	Multiple Choice	1	HS-LS4-3
41	Multiple Choice	1	HS-LS2-1
42	Constructed Response	1	HS-ETS1-3
43	Multiple Choice	1	HS-LS3-1
44	Multiple Choice	1	HS-LS1-1
45	Constructed Response	1	HS-LS1-1
46	Multiple Choice	1	HS-LS3-2
47	Constructed Response	1	HS-LS1-4
48	Multiple Choice	1	HS-ETS1-2

* This item map identifies the Performance Expectation with which each test question is aligned. All NYSP-12SLS Performance Expectations are three-dimensional (https://www.nysed.gov/sites/default/files/programs/standards-instruction/p-12-science-learning-standards.pdf). The integration of these three dimensions provides students with a context for the content of science (DCI), the methods by which science knowledge is acquired and understood (SEP), and the ways in which the sciences are connected through concepts that have universal meaning across the disciplines (CCC).

The State Education Department / The University of the State of New York

Regents Examination in Life Science: Biology – June 2025

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the June 2025 exam only.)

Raw Score	Scale Score	Performance Level
48	**100**	5
47	**98**	5
46	**96**	5
45	**94**	5
44	**93**	5
43	**91**	5
42	**90**	5
41	**88**	5
40	**87**	5
39	**86**	5
38	**85**	5
37	**84**	4
36	**83**	4
35	**82**	4
34	**81**	4
33	**80**	4
32	**79**	4

Raw Score	Scale Score	Performance Level
31	**78**	4
30	**77**	4
29	**76**	4
28	**75**	3
27	**74**	3
26	**72**	3
25	**71**	3
24	**70**	3
23	**68**	3
22	**67**	3
21	**65**	3
20	**63**	2
19	**61**	2
18	**59**	2
17	**57**	2
16	**55**	2

Raw Score	Scale Score	Performance Level
15	**53**	1
14	**50**	1
13	**47**	1
12	**45**	1
11	**42**	1
10	**39**	1
9	**36**	1
8	**32**	1
7	**29**	1
6	**25**	1
5	**21**	1
4	**17**	1
3	**13**	1
2	**9**	1
1	**5**	1
0	**0**	1

To determine the student's final examination score (scale score), find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Life Science: Biology.