



**End-of-Year Assessment**  
**Biology**

Congratulations! You worked hard to learn many new things this school year. Taking this Biology test is a great way to show your family and school what you learned. It is okay if you do not know all the answers. Just try your best. You are amazing! You are taking this test so adults can learn more about how to help you.

You can ask an adult for help if you do not understand the directions. You can use scratch paper and basic, scientific, and graphing calculators for this test.

If you do not know the answer to a question, choose the answer you think might be correct. You must answer the questions on your own.

You are now ready to start. Take your time and remember that trying your best is what is important. You're awesome, and you'll do great!

## EOY Biology

Student \_\_\_\_\_

Class \_\_\_\_\_

Date \_\_\_\_\_

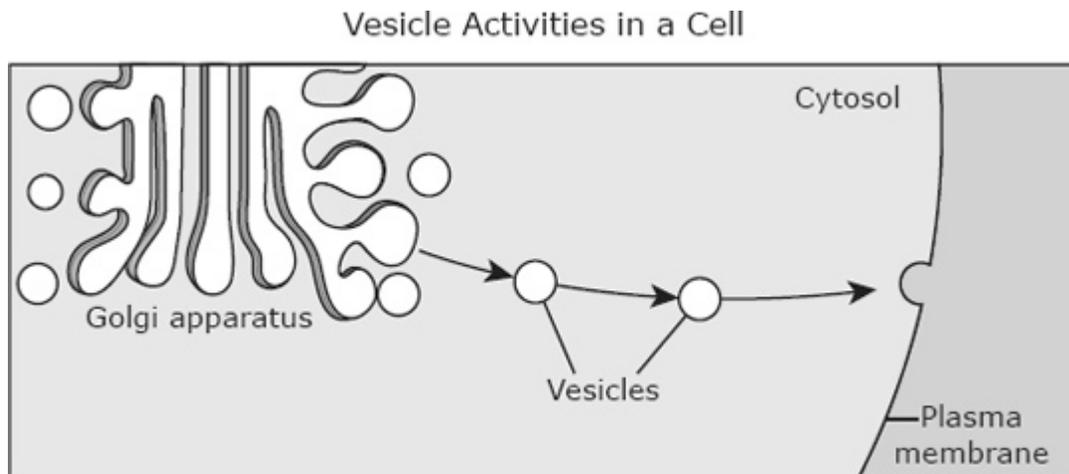
1. The picture shows a student using a microscope to study a prepared slide of a single-celled organism.



A single-celled organism can be classified as a prokaryote based on the absence of —

- A. a cell membrane
- B. ribosomes
- C. chromosomes
- D. a nucleus

2. The diagram illustrates the activity of vesicles during a cellular process.



Which statement best explains the function of the vesicles?

- A. Delivering packaged materials to the Golgi apparatus for protein synthesis
- B. Exchanging genetic information between the Golgi apparatuses of separate cells
- C. Extracting portions of the Golgi apparatus to be regenerated for growth within the cell
- D. Transporting packaged molecules from the Golgi apparatus to be released out of the cell

3. The Indian leaf butterfly has traits that allow it to resemble a leaf. The bright colors of the monarch butterfly indicate that the butterfly tastes bad and can be poisonous.

How does the appearance of these butterflies help them to survive?

- A. The Indian leaf butterfly is able to avoid predators while the monarch butterfly warns predators away.
  - B. The Indian leaf butterfly frightens predators away while the monarch butterfly poisons predators before they can eat it.
  - C. Both butterflies rely on camouflage to avoid predation.
  - D. Both butterflies cooperate with one another to avoid predation.
4. The female reproductive and endocrine systems work interactively for which main purpose?
- A. To maintain homeostasis by removing waste products from the body
  - B. To release neurotransmitters during times of stress
  - C. To control hormone levels to prepare the body for pregnancy
  - D. To exchange gases to support cellular aerobic respiration

5. In humans blood type is determined by the A, B, and O alleles. The A and B alleles are codominant to each other and dominant over the O allele. An individual with the AO genotype and an individual with the BO genotype can produce offspring with which of the following phenotypes?
- A. O only
  - B. A or B only
  - C. A, B, or O only
  - D. A, B, AB, or O
6. The human immunodeficiency virus (HIV) often infects and destroys CD4 T cells. These CD4 T cells are one of many kinds of white blood cells that are an important part of the immune system.

The most common danger related to the destruction of CD4 T cells is —

- A. an increase in the risk of high blood pressure
- B. an increase in the threat of diseases caused by microorganisms and viruses
- C. a decrease in the flow of blood to vital organs
- D. a decrease in the amount of oxygen being transported to tissues

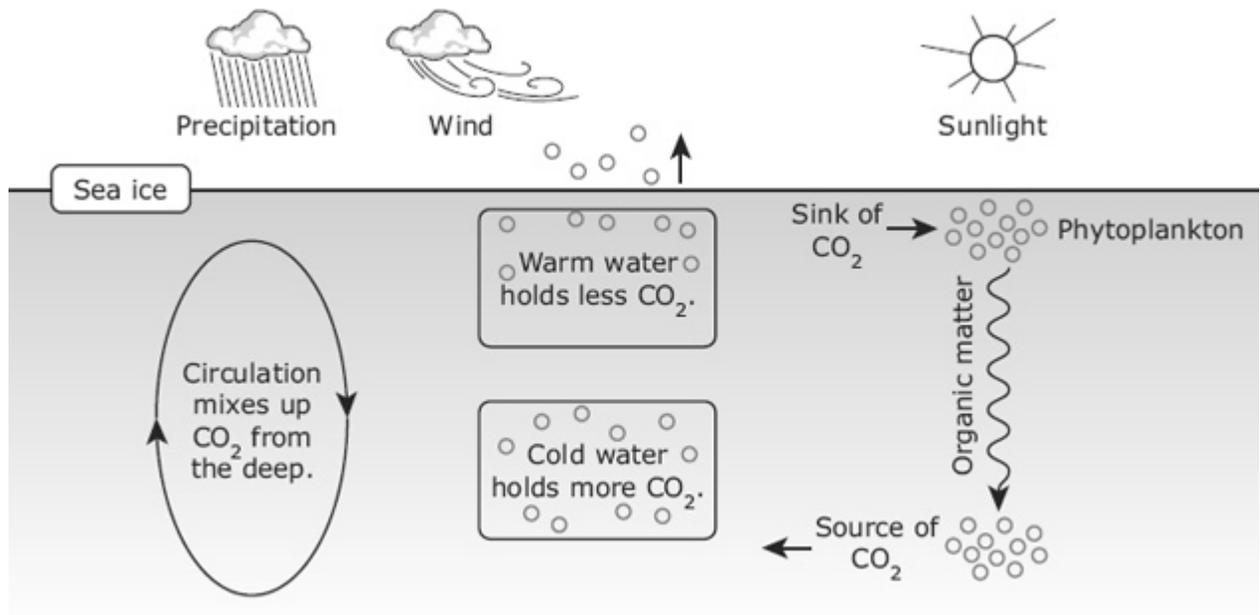
7. In the early 1900s a scientist hypothesized a link between DNA and the production of proteins in the cytoplasm. However, the fact that DNA could not be found outside the nucleus led scientists to believe that another substance was also involved in the synthesis of protein in the cytoplasm. In the 1940s scientists performed an experiment that ultimately identified the site of protein synthesis. They also identified the molecule responsible for transporting information from the nucleus to the site of protein synthesis. What was this newly identified molecule?
- A. A gene
  - B. mRNA
  - C. ATP
  - D. Thymine
8. Common baboons live on the savanna in breeding groups called troops. While females tend to stay with the troop, younger or less dominant males may leave to join a neighboring troop. Which of these is a likely outcome of movement by young males?
- A. Gene flow occurs between populations.
  - B. Allele frequencies suddenly change.
  - C. Relative genotypic frequencies reach a constant state.
  - D. Intermediate phenotypes increase in the species.

9. The San Marcos salamander, *Eurycea nana*, is a light reddish-brown translucent salamander about 2–5 cm in length. *E. nana* is found only in Spring Lake and a portion of the San Marcos River.

Which human activity would most likely decrease the ability of the salamanders to survive?

- A. Increasing water consumption that decreases the flow of clean water from the springs that feed the river
  - B. Public transportation that reduces the number of automobiles that contribute to pollution runoff into the river
  - C. Tourism that helps fund the educational programs related to river ecosystem conservation
  - D. The addition of a new food source into the river that limits competition for resources
10. Bactrian camels, dromedaries, llamas, and alpacas are all members of the same taxonomic family, Camelidae. Members of this family all have two toes, no hooves, true canine teeth, and a split upper lip. The family Camelidae originated in North America. The physical features of animals in this family and the family's geographical origin provide evidence that all these animals —
- A. live in the same type of ecosystem
  - B. have slowly evolved to become herbivores
  - C. have a common ancestor
  - D. exchanged DNA at some point in the past

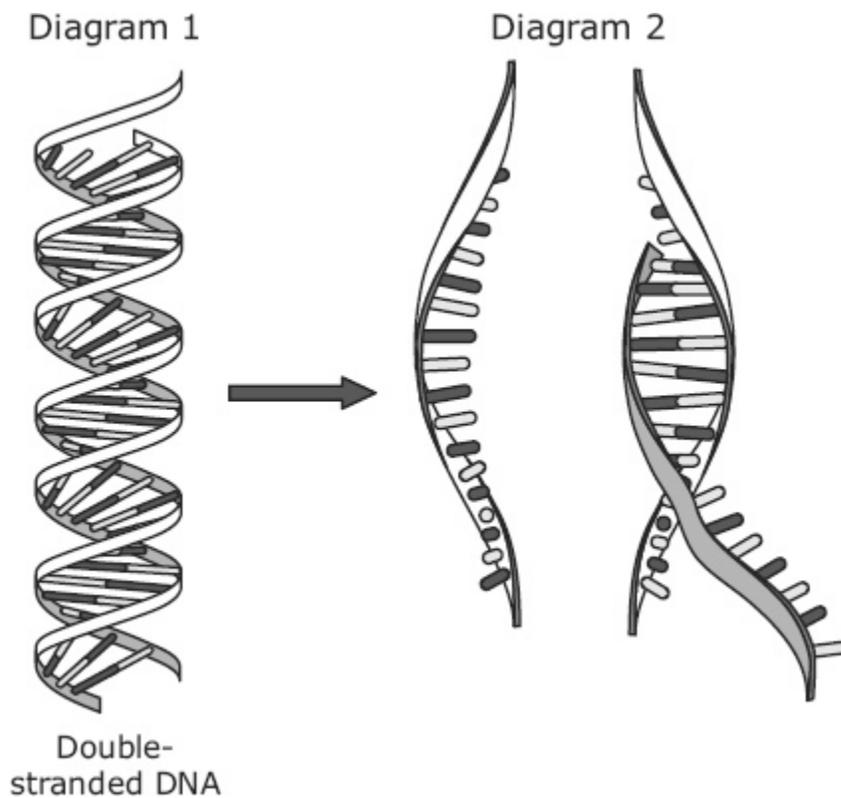
11. This diagram demonstrates why the ocean is a large carbon sink.



An increase in the amount of carbon dioxide in the atmosphere can cause atmospheric temperatures to increase. Which statement explains how this could affect the ocean as a carbon sink?

- A. Less atmospheric carbon dioxide would be available to phytoplankton.
- B. Dissolved carbon dioxide gas in the ocean would increase because surface winds would cause a deeper circulation pattern, making more room for the gas.
- C. Less carbon dioxide gas would be contained in the ocean because increasing precipitation would dilute the carbon entering the ocean.
- D. Less carbon dioxide would be dissolved in the ocean because increasing atmospheric temperatures would cause ocean temperatures to increase.

12. The initial steps in gene expression are modeled below. Double-stranded DNA first unwinds into two strands.



Which process and product are represented in Diagram 2?

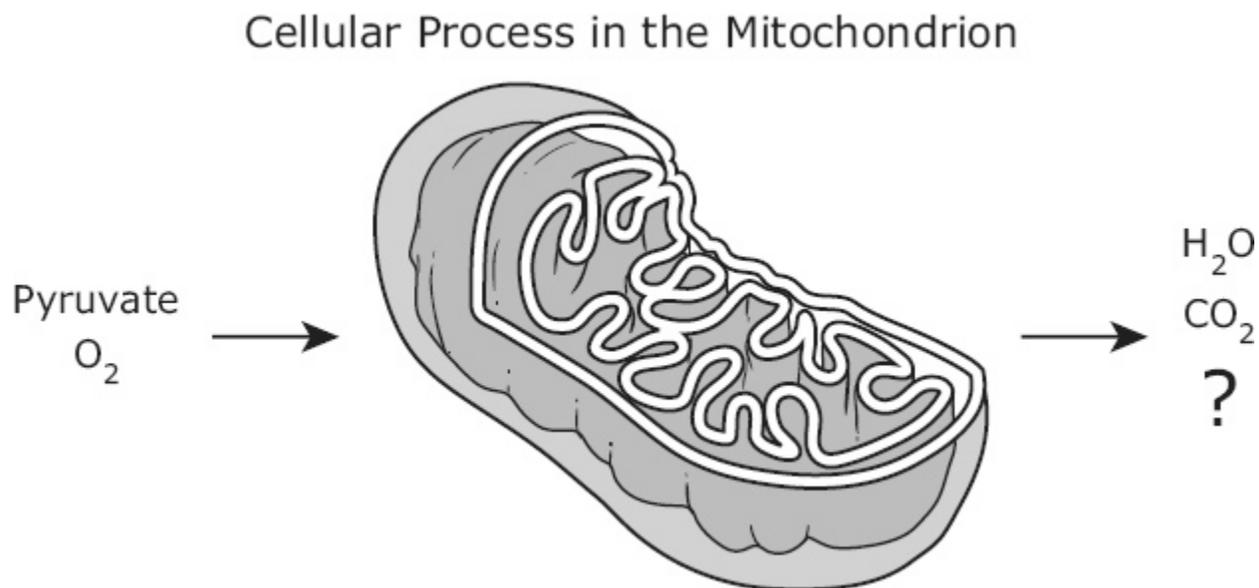
- A. Process: transcription; product: mRNA
- B. Process: translation; product: protein
- C. Process: replication; product: tRNA
- D. Process: recombination; product: polymerase

**13.** A small town in the piney woods of East Texas has a soccer field composed of native grasses. The soccer field is mowed once a week.

What effect does continual mowing have on the ecology of the field?

- A.** Mowing increases the likelihood of nonnative species displacing native species.
- B.** Mowing increases the number of species found in the field.
- C.** Mowing causes different types of communities to form across the field.
- D.** Mowing maintains a low species diversity by inhibiting further succession.

14. The diagram shows molecules that a mitochondrion uses and produces during a cellular process.



Which other molecule is a product of this process?

- A. DNA
- B. RNA
- C. C<sub>6</sub> H<sub>12</sub> O<sub>6</sub>
- D. ATP

- 15.** From a single fertilized ovum undergoing a series of rapid cell divisions, a human infant develops. The embryonic cells become specialized for a variety of functions. Which of these statements best describes how different cell types develop?
- A.** Each cell type contains only the active parts of the DNA needed for that cell type.
  - B.** Each cell type has only one chromosome containing the DNA needed for that cell type.
  - C.** Each cell has an identical copy of DNA with enzymes controlling the expression of specific genes, leading to a variety of cells.
  - D.** Each cell has multiple copies of DNA that are affected in different ways by the environment to change the function of the cell at regular intervals.
- 16.** The activities in the cell cycle occur during specific phases. In which phase of the cell cycle is DNA replicated?
- A.** Mitosis
  - B.** G<sub>1</sub> phase
  - C.** G<sub>2</sub> phase
  - D.** S phase

**17.** The white cattail is a hybrid species of plant that is a result of the cross between the broad-leaved cattail and the narrow-leaved cattail. Over time, the white cattail has established itself in the wetlands of Midwestern states.

Which of these explains the success of the white cattail?

- A.** Favorable genes from parental generations provide advantageous characteristics to the hybrid species.
- B.** Hybridization produces offspring traits that allow different species to survive in extreme environments.
- C.** Inherited traits passed on from parental generations make hybrid species more susceptible to disease.
- D.** Hybrid species display more adaptations due to their reduced genetic diversity.

**18.** Cytokinins are a class of plant hormones that help regulate growth by promoting cell division. Cytokinins are produced mainly in meristematic tissue, where most plant growth occurs. Which system carries cytokinins produced in the roots to the rest of the plant?

- A.** Vascular system
- B.** Dermal system
- C.** Reproductive system
- D.** None of these

19. The gray squirrel, Eastern fox squirrel, and red squirrel are all different species of squirrels. Why is having a scientific name for each species of an organism important?
- A. To prevent existing named organisms from having their names changed as they become extinct
  - B. To keep the classification system from being altered as new organisms are discovered
  - C. To allow organisms to be placed in many classification levels at the same time
  - D. To standardize the naming and organization of organisms to avoid confusion
20. Students are given data from an investigation that identified some of the chemical elements present in four different samples.

Elements Present in Samples

Sample	Elements
1	Hydrogen, phosphorus, and nitrogen
2	Aluminum, silicon, and copper
3	Calcium, potassium, and nitrogen
4	Iron, oxygen, and magnesium

Which sample was most likely DNA?

- A. Sample 1
- B. Sample 2
- C. Sample 3
- D. Sample 4

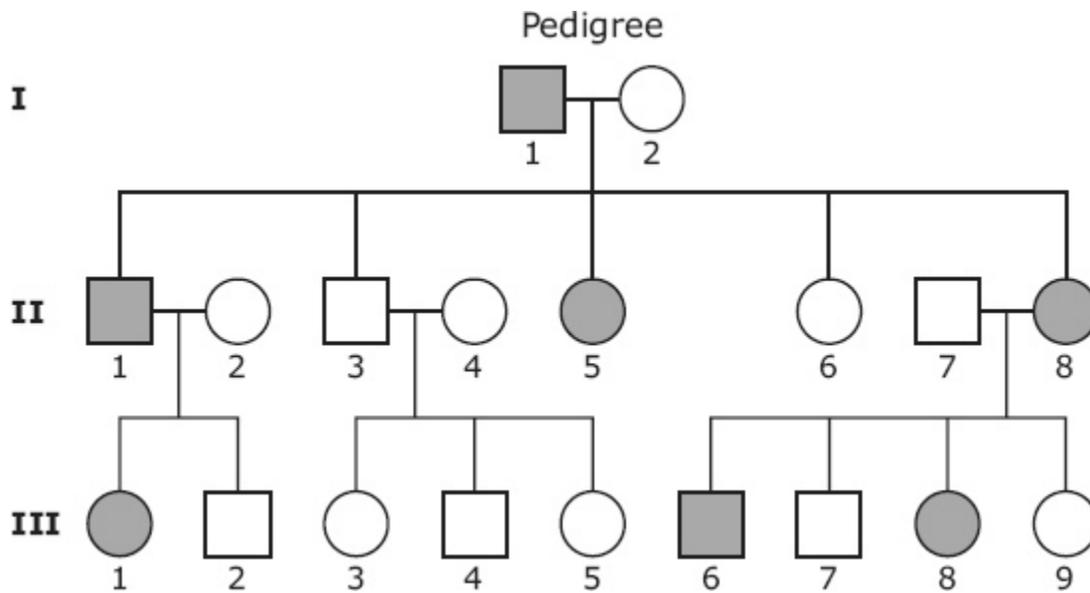
21. The quiver tree grows in desert areas in southern Africa. In recent decades average temperatures have been rising in southern Africa. Scientists predict that this warming trend will continue. Quiver trees in the hottest parts of their range near the equator are dying, but quiver trees at high elevations or in parts of the range that are farther from the equator are growing and reproducing.



Which of these best explains what is happening to the quiver tree population in southern Africa?

- A. Individual quiver trees are unable to adjust to the rising temperatures, and only those in cooler parts of the range will survive.
- B. The quiver tree species is unable to survive rising temperatures throughout its range. The species is likely to undergo rapid extinction.
- C. Individual quiver trees can quickly adapt to rising temperatures. Individual trees will change their method of seed dispersal in cooler parts of the range.
- D. The quiver tree species will survive by producing offspring suited for warmer temperatures.

22. The inheritance pattern for an autosomal dominant trait is shown in the pedigree. Shaded symbols represent individuals that express the dominant trait.

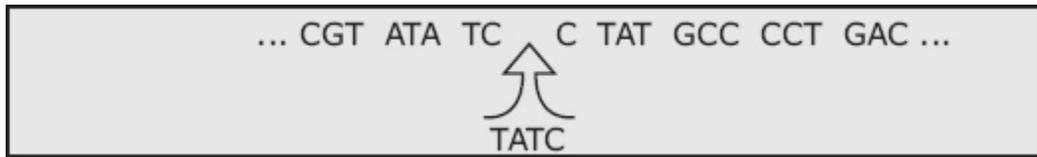


Based on this pedigree, what are the most likely genotypes of individuals I-1 and I-2?

- A. I-1: aa  
I-2: Aa
- B. I-1: AA  
I-2: Aa
- C. I-1: Aa  
I-2: aa
- D. I-1: aa  
I-2: AA

- 23.** When cells lose their ability to regulate the cell cycle, they can divide at an accelerated rate and form a mass of cells. This mass of cells is referred to as —
- A.** a tumor
  - B.** an embryo
  - C.** a gland
  - D.** an organ
- 24.** Nitrogenous bases are located on both strands of the DNA double helix. What is the significance of the nitrogenous bases?
- A.** The number of adenines and cytosines determines the type of RNA that will be produced.
  - B.** The order of nitrogenous bases determines the order of amino acids in the proteins synthesized.
  - C.** The amount of thymine and guanine in the DNA molecules determines the length of the genes.
  - D.** The type of hydrogen bonding between the nitrogenous bases determines which amino acid will be added to the peptide chain.

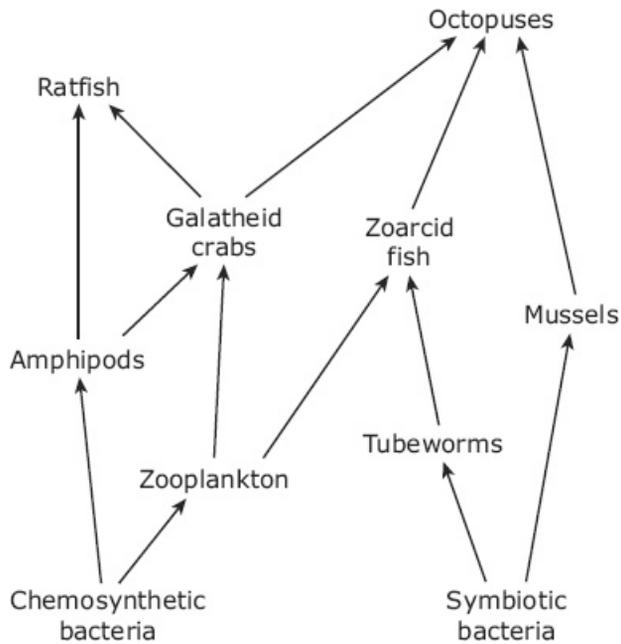
25. The model shows a mutation to a partial sequence of bases in a gene.



Which type of mutation does the model demonstrate?

- A. Deletion
- B. Insertion
- C. Substitution
- D. Translocation

26. Part of a hydrothermal vent food web is represented in the diagram.



Which organisms are both secondary and tertiary consumers in this food web?

- A. Chemosynthetic bacteria and amphipods
- B. Zooplankton and mussels
- C. Ratfish and octopuses
- D. Galatheid crabs and zoarcid fish

27. Five general characteristics of organisms in kingdoms Plantae or Fungi are listed in the box.

General Characteristics

1. Alternation of generations possible
2. Are mostly nonmotile
3. Are eukaryotic
4. Are photosynthetic
5. Are vascular and have a wide variety of specialized tissues

Which table correctly lists the characteristics of the organisms in the two kingdoms?

**A.**

Characteristic	Kingdom Plantae	Kingdom Fungi
1	✓	✓
2	✓	✓
3	✓	✓
4	✓	
5	✓	

**B.**

Characteristic	Kingdom Plantae	Kingdom Fungi
1		✓
2		
3	✓	✓
4	✓	✓
5	✓	

**C.**

Characteristic	Kingdom Plantae	Kingdom Fungi
1	✓	✓
2		✓
3	✓	✓
4	✓	✓
5		✓

**D.**

Characteristic	Kingdom Plantae	Kingdom Fungi
1		✓
2	✓	
3	✓	✓
4	✓	✓
5	✓	

**28.** Cells pass through a G<sub>2</sub> checkpoint before entering mitosis. Ideally, if DNA damage is detected, the cells do not enter mitosis until the damage is repaired. Why is DNA damage repaired before cells enter mitosis?

- A.** So that another round of DNA synthesis does not have to take place
- B.** So that the chromosomes can align at the metaphase plate during mitosis
- C.** So that the cytoplasm can be divided equally between the two daughter cells
- D.** So that healthy daughter cells are produced, allowing the organism to continue growing

- 29.** Grassland ecosystems in Texas have evolved to depend on periodic fires to return nutrients to the soil and encourage plant reproduction. Humans have prevented fires in many of these grassland areas, resulting in plant and animal communities with little diversity. Wildlife biologists often recommend purposefully starting fires called prescribed burns, which are monitored and controlled, in grassland ecosystems every 3 to 4 years. These biologists observe greater diversity in plant and animal life in the years following a prescribed burn.

What natural processes are the biologists attempting to imitate?

- A.** Biomagnification
- B.** Succession
- C.** Population bottleneck
- D.** Species extinction

- 30.** Niles Eldredge and Stephen Jay Gould researched the lenses of the eyes of fossil trilobites of different species. In 1972 they published a paper in which they described the tendency of a species to remain the same until a sudden change in the environment causes a new related species to appear.

Which hypothesis was most challenged by the work of Eldredge and Gould?

- A.** Redi's hypothesis that spontaneous generation does not occur
- B.** Haeckel's hypothesis that embryological development mimics the evolution of species
- C.** Wallace's hypothesis that geography affects the distribution of species
- D.** Darwin's hypothesis that the development of species is a slow, gradual process

31. A chart of some plant systems and functions is shown.

Option	System	Functions
1	Root	absorption of water and nutrients
2	Shoot	seed dispersal and absorption of CO <sub>2</sub>
3	Root	respiration and food storage
4	Shoot	photosynthesis and food transport

Which system interactions are dependent on the plant's ability to respond to the direction of light?

- A. Option 1
- B. Option 2
- C. Option 3
- D. Option 4

32. Which of these is the direct result of an error in the transcription of a DNA nucleotide?

- A. The nuclear membrane is ruptured.
- B. Amino acids do not bond to tRNA.
- C. A codon sequence is incorrect.
- D. Transportation of mRNA does not occur.

33. Four common relationships between organisms are listed in the box.

1. Bees pollinate plants as they move from flower to flower gathering nectar.
2. Green algae grow on the backs of spider crabs living in shallow water, camouflaging the spider crabs while the crabs protect the algae from predators.
3. Fleas live on the skin of dogs and obtain nutrients from the dogs' blood.
4. Nitrogen-fixing bacteria obtain nutrients from their host plants and use the nutrients to supply nitrogen to the plants.

Which statements best describe these relationships?

**A.** Relationships 1 and 4 are examples of mutualism.

Relationship 2 is an example of commensalism.

Relationship 3 is an example of parasitism.

**B.** Relationships 1 and 2 are examples of commensalism.

Relationships 3 and 4 are examples of mutualism.

**C.** Relationship 1 is an example of commensalism.

Relationships 2 and 4 are examples of mutualism.

Relationship 3 is an example of predation.

**D.** Relationships 1, 2, and 4 are examples of mutualism.

Relationship 3 is an example of parasitism.

**34.** Scientists use zebra fish to study human genetic diseases because zebra fish and humans share many of the same genetic diseases.

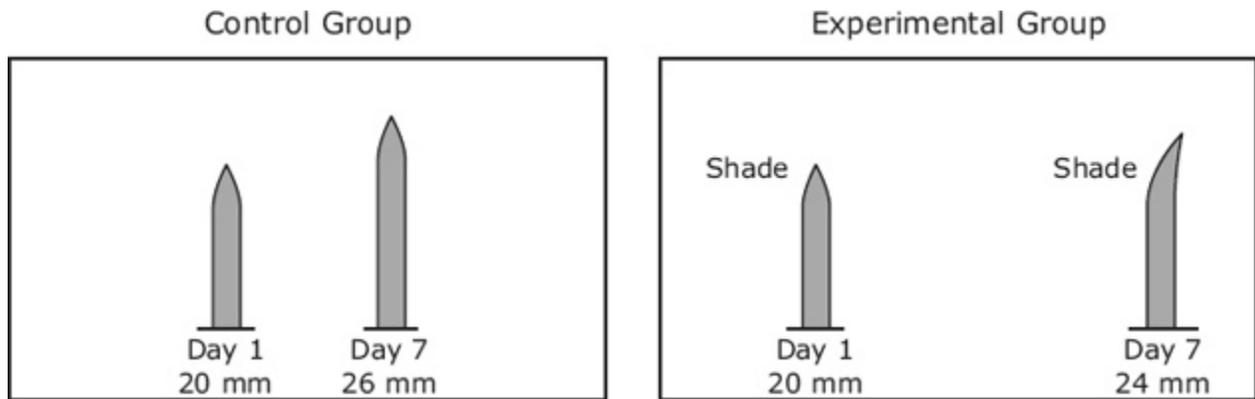
Which statement describes why zebra fish experience similar genetic diseases as humans?

- A.** Zebra fish have an omnivorous diet similar to that of humans.
- B.** Zebra fish have nucleotide sequences similar to those of humans.
- C.** Zebra fish go through embryonic stages similar to those of humans.
- D.** Zebra fish produce gametes through a process that is similar to that of humans.

**35.** People who have Alzheimer's disease experience an increasing loss of brain function and cognition over time. Alzheimer's is characterized by a buildup of abnormal protein fragments that damage brain cells. Recently scientists have discovered an enzyme, BACE2, that decreases these abnormal protein fragments in the brain of a person with Alzheimer's disease. Which statement explains how BACE2 most likely works?

- A.** BACE2 breaks down into smaller pieces that react with the abnormal protein fragments, forming more complex molecules.
- B.** BACE2 speeds up the reaction that breaks down the abnormal protein fragments.
- C.** BACE2 molecules link several abnormal protein fragments together, forming a complete protein.
- D.** BACE2 is a reactant that combines with the abnormal protein fragments.

36. A student conducted an investigation to study phototropism in grasses. The only difference between the control group and the experimental group was light conditions. The control group was provided full light, while the experimental group was shaded on one side. The diagrams show the average heights and positions of blades of grass in the investigation.



Which statement best explains why the grass tips of the experimental group bent toward the light?

- A. Water evaporated faster on the side of the plant having full light.
- B. Light sensors in the grass tips stimulated a hormone in the shoot system.
- C. The xylem in the root system absorbed more nutrients from the shaded side.
- D. The side facing the light has a greater chance of absorbing carbon dioxide from the atmosphere.

37. Which role of protists has the most positive effect on maintaining the plant population in an ecosystem?

- A. Protists are a major food source for animals.
- B. Protists produce approximately 75 percent of the oxygen on Earth.
- C. Protists decompose dead materials, returning nutrients to the soil.
- D. Protists found in the gut of animals assist in digestion.

38. A table of four types of carbohydrates is shown.

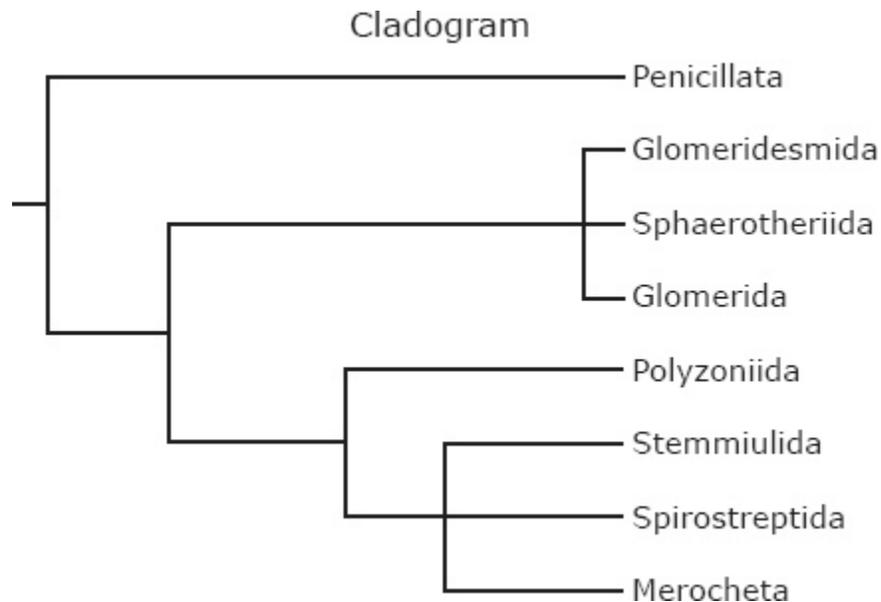
Type of Carbohydrate	Description
Cellulose	Major component of plant cell walls
Chitin Major	component of fungal cell walls and arthropod exoskeletons
Glycogen	Stored in liver and muscle cells, broken down to glucose when blood glucose levels decrease
Starch	Stored in plant roots and seeds, provides food for seeds to germinate or for animal consumption

Which list correctly matches the functions to the types of carbohydrates?

- A. Energy: glycogen and starch  
Structure: cellulose and chitin
- B. Energy: cellulose and chitin  
Structure: glycogen and starch
- C. Energy: chitin and glycogen  
Structure: cellulose and starch
- D. Energy: cellulose and starch  
Structure: chitin and glycogen

- 39.** Gametes produced by an organism contain a combination of genes from that organism. In every gamete, this combination is —
- A.** the same because it is created from the same DNA
  - B.** the same because chromosomes are copied prior to meiosis
  - C.** different due to DNA replication prior to mitosis
  - D.** different due to independent assortment during meiosis
- 40.** Which of the following is most likely to cause the greatest disruption to an ecosystem?
- A.** Emptying an aquarium containing non-native species into a local waterway
  - B.** Cutting down a small cedar tree to make holiday decorations
  - C.** Cleaning the windshield of a car with an alcohol-based glass cleaner
  - D.** Mowing the lawn in a city park

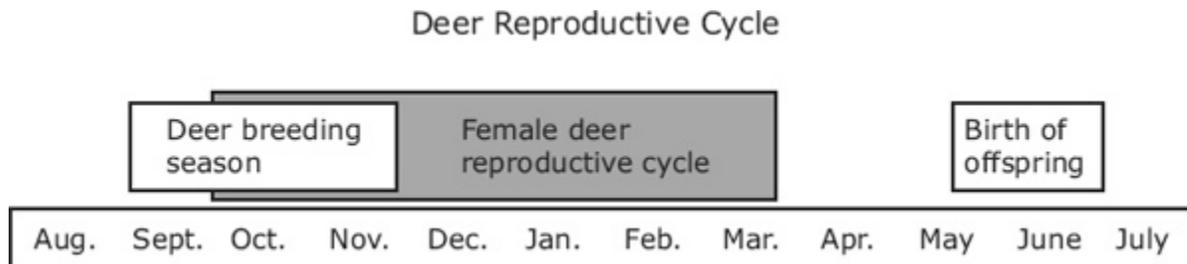
41. The relationships among different orders of millipedes are shown in the cladogram.



Based on this cladogram, which statement best describes relationships among millipede orders?

- A. Stemmiulida is more closely related to Merocheta than Penicillata is to Merocheta.
- B. Spirostreptida is more closely related to Glomerida than Sphaerotheriida is to Glomerida.
- C. Polyzoniida is more closely related to Glomeridesmida than Sphaerotheriida is to Glomeridesmida.
- D. Merocheta is more closely related to Glomeridesmida than Glomerida is to Glomeridesmida.

42. White-tailed deer are seasonal breeders. Female white-tailed deer begin their reproductive cycle in the fall. Rising testosterone levels in male white-tailed deer cause them to start their breeding season around the same time. Offspring are born the following spring and summer.



What is the most likely explanation for white-tailed deer having a seasonal breeding cycle instead of a monthly breeding cycle like many domesticated animals?

- A. Male and female deer come into contact with each other only in the fall.
  - B. Large predators are not found in deer habitats during the spring and summer months.
  - C. Giving birth only in the spring and summer ensures that offspring are born when food is most available.
  - D. Deer give birth in the spring and summer in order to avoid being pregnant during the hot summer months.
43. Which statement accurately describes the energy needs for photosynthesis and cellular respiration?
- A. Solar energy is needed for cellular respiration but not for photosynthesis.
  - B. Chemical energy in the form of glucose is needed for both cellular respiration and photosynthesis.
  - C. Chemical energy in the form of glucose is needed for photosynthesis, and solar energy is needed for cellular respiration.
  - D. Solar energy is needed for photosynthesis, and chemical energy in the form of glucose is needed for cellular respiration.

44. The table shows the survival rate of two types of beetles in the same environment over a period of three years.

Survival  
Rates

Year	Green Beetle (%)	Brown Beetle (%)
1	78	31
2	83	29
3	77	28

Which statement about the beetles in this environment is best supported by the data?

- A. Green beetles are more fit for the environment than brown beetles are.
- B. Brown beetles undergo a greater number of unfavorable mutations than green beetles do.
- C. Green beetles have a greater gene frequency among their population than brown beetles have.
- D. Brown beetles have a shorter life cycle than green beetles have.

45. The table shows some observations made by four students during a field trip to a nature area.

Student	Observations
1	10 white-tailed deer
2	2 blue jays, 3 northern cardinals, and 1 house sparrow eating seeds
3	1 snapping turtle on a rock; 2 snapping turtles near the edge of a pond
4	6 bullfrogs in a pond; 30 bullfrog tadpoles hatching from eggs

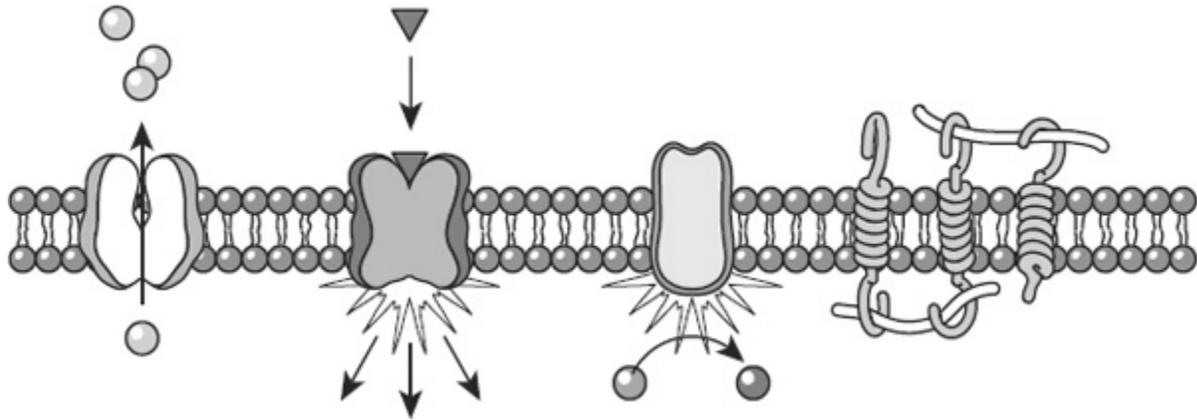
Which student made observations of a community of organisms?

- A. Student 1
- B. Student 2
- C. Student 3
- D. Student 4

46. Which of these describes a difference between viruses and cells?

- A. Cells contain protein, and viruses contain only carbohydrates.
- B. Viruses have flagella, and cells have only cilia.
- C. Cells reproduce independently, and viruses require a host to reproduce.
- D. Viruses have membranes made of proteins, and cells have membranes made of nucleic acid.

47. Transmembrane proteins span the width of cell membranes. Four types of transmembrane proteins are shown in a section of cell membrane.



Although these proteins have different specific functions, they all —

- A. stop chemical reactions within the cell
- B. synthesize molecules that signal other cells
- C. help the cell interact with its external environment
- D. remove large waste particles from the cytoplasm of the cell

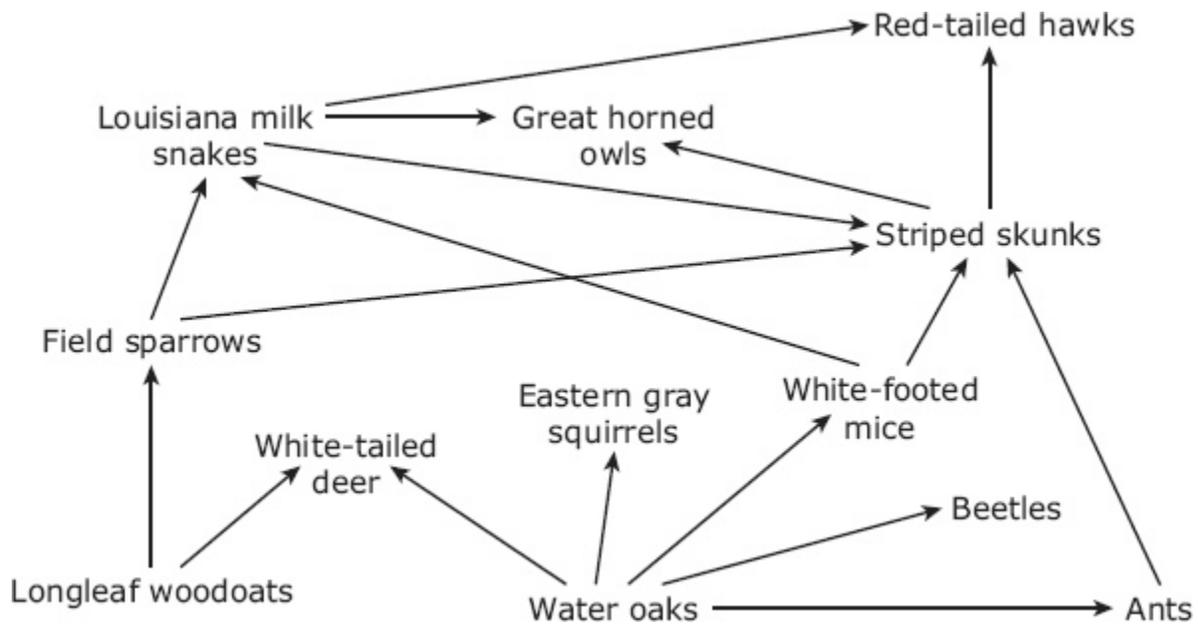
48. A student studying interactions between body systems constructs this table. The student plans to fill out the table with phrases that describe an interaction between each pair of systems.

	Skeletal	Circulatory	Muscular	Digestive	Respiratory	Urinary	Nervous
Skeletal							
Circulatory							
Muscular							
Digestive			<b>X</b>				
Respiratory							
Urinary							
Nervous							

Which of these phrases could be placed in the position marked with an X?

- A. Provides nutrients to kidney cells
- B. Provides nutrients to brain cells
- C. Provides nutrients to nerve cells
- D. Provides nutrients to muscle cells

49. The diagram shows a partial East Texas food web.



Which table correctly classifies these organisms?

**A.**

Producers	Striped skunks, great horned owls, red-tailed hawks
Primary consumers	Striped skunks, Louisiana milk snakes
Secondary consumers	Field sparrows, white-tailed deer, eastern gray squirrels, white-footed mice, beetles, ants
Top predators	Longleaf woodoats, water oaks

**B.**

Producers	Longleaf woodoats, water oaks
Primary consumers	Field sparrows, white-footed mice, beetles, ants
Secondary consumers	Striped skunks, Louisiana milk snakes, eastern gray squirrels, white-tailed deer
Top predators	Striped skunks, great horned owls, red-tailed hawks

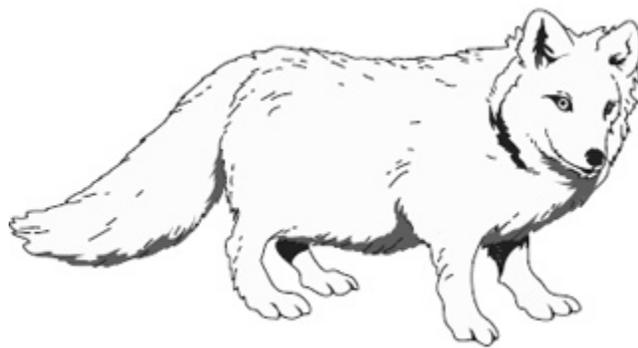
**C.**

Producers	Longleaf woodoats, water oaks
Primary consumers	Field sparrows, white-tailed deer, eastern gray squirrels, white-footed mice, beetles, ants
Secondary consumers	Striped skunks, Louisiana milk snakes
Top predators	Great horned owls, red-tailed hawks

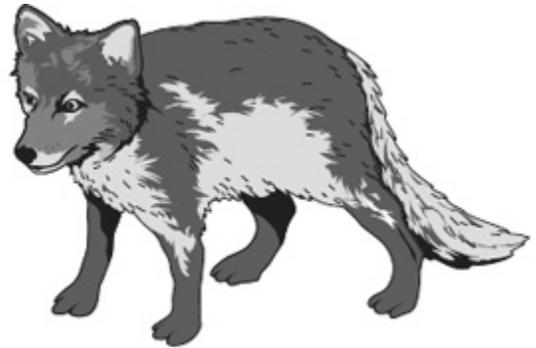
**D.**

Producers	Longleaf woodoats, water oaks, beetles, ants
Primary consumers	Field sparrows, white-tailed deer, eastern gray squirrels, white-footed mice
Secondary consumers	Striped skunks, Louisiana milk snakes
Top predators	Striped skunks, great horned owls, red-tailed hawks

50. The arctic fox inhabits northern areas of North America. The same arctic fox is shown in the drawing at different times of the year.



January



July

What causes this change in fur color?

- A. The alleles for fur color change as the arctic fox grows older.
- B. Gene expression for fur color is regulated by latitude.
- C. The arctic fox has two traits for fur color that are determined at birth.
- D. Gene expression for fur color is regulated by temperature.



