

# **Biology**

**Administered May 2016**

**RELEASED**

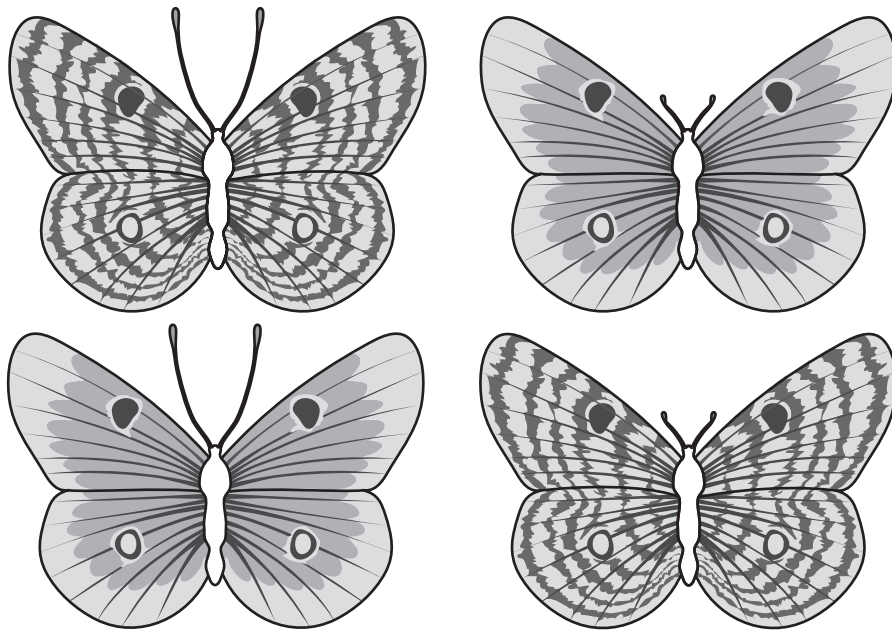


# BIOLOGY

## DIRECTIONS

Read each question carefully. Determine the best answer to the question from the four answer choices provided. Then fill in the answer on your answer document.

- 1 The four butterflies in the illustrations represent the offspring in the  $F_1$  generation.

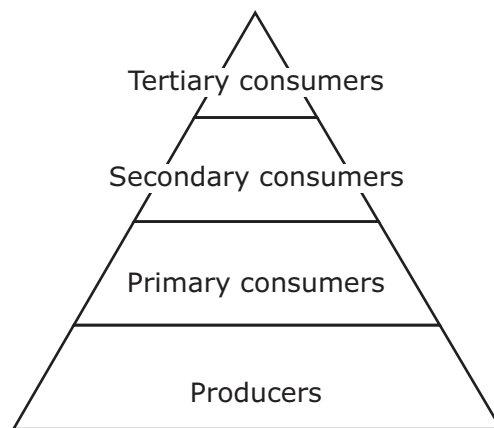


Which statement is best supported by the phenotypes of these offspring?

- A The  $F_1$  generation is composed only of males.
- B Two of the offspring in the  $F_1$  generation will not be able to reproduce.
- C The  $F_1$  generation is the result of a dihybrid cross.
- D Two of the offspring in the  $F_1$  generation will experience a spontaneous mutation.

- 2 The 1918 influenza epidemic killed between 50 million and 100 million people worldwide. This epidemic happened near the end of World War I. More people died from the influenza epidemic than were killed in the war. Which of the following explains why this virus was so deadly worldwide?
- F Infected soldiers returning from the war spread the virus when they coughed.
  - G Food was scarce because of the war, so people were undernourished, and their immune systems were weakened.
  - H Medical personnel often became ill as a result of exposure to airborne virus particles.
  - J All of the above
- 

- 3 The amount of energy the producers in this energy pyramid provide the primary consumers is 54,000 joules. From this amount, 540 joules are provided to the tertiary consumers.

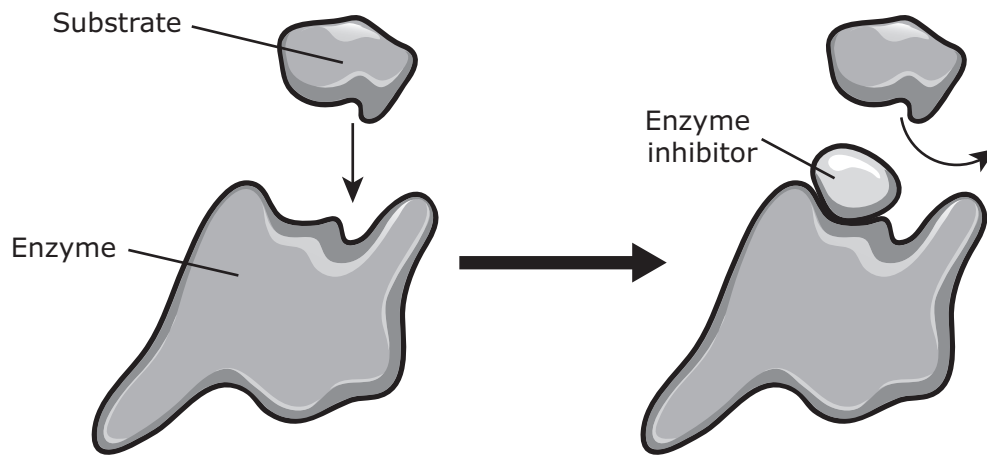


Based on this model, how much of the energy was provided to secondary consumers?

- A 53,460 J
- B 5,400 J
- C 540 J
- D 54 J

- 4 The survival of a species depends on its ability to adapt to changes in the environment. A species must be capable of surviving and reproducing despite changes to food sources, climate, or threats from predators. Which statement correctly describes a way that mutations increase the likelihood that a species will survive in a changing environment?
- F Mutations are a source of variation in the species.
  - G Mutations are the cause of disease in the species.
  - H Mutations are not harmful when they occur in somatic cells of the species.
  - J Mutations are always passed on to subsequent generations of the species.

- 
- 5 The diagram represents one way an enzyme can be inhibited.



Which statement explains the effect of an inhibitor on an enzyme?

- A A substrate will be able to bond with the enzyme.
- B The enzyme will likely be attacked by immune cells.
- C The enzyme will be unable to produce more enzymes.
- D A substrate will be unable to attach to the enzyme.

- 6 Four different nucleotides are used as building blocks of DNA. Which of the following can be used to distinguish one nucleotide from another?
- F The nitrogenous base
  - G The shape of the deoxyribose sugar
  - H The length of the phosphate group
  - J The type of fatty acid
- 

- 7 The green frog (*Lithobates clamitans clamitans*) is found in many parts of the United States. The table contains some information about this frog.

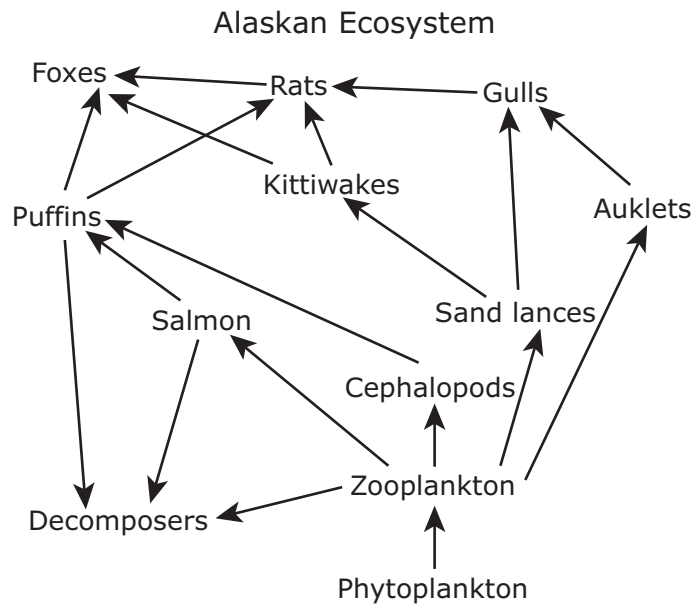
Reproduction Facts for *L. clamitans clamitans*

Breeding season	Late spring
Length of breeding season	1 to 3 months
Breeding habitats	Swamps, ponds, marshes, slow-moving streams
Number of eggs per clutch	1,000 to 5,000
When eggs hatch	3 to 7 days

Why does the ability to lay 1,000 to 5,000 eggs increase the fitness of the species *L. clamitans clamitans*?

- A It increases opportunities for offspring to compete for limited resources.
- B It increases the probability that some offspring will survive long enough to reproduce.
- C It increases the probability that moving water will promote gene flow from one population to another.
- D It increases the chance of the recombination of alleles, leading to genetic drift in the population.

- 8 Food webs such as the one shown were first used in 1927 by the animal ecologist Charles Elton. The food web below represents the feeding relationships among organisms in an Alaskan ecosystem.



An environmental change that removed which of these organisms from the ecosystem would cause the most instability in the ecosystem?

- F Auklets
- G Foxes
- H Salmon
- J Zooplankton

- 
- 9 During the final stages of human gestation, receptors for the hormone oxytocin increase on the smooth muscle cells of the uterus. The release of oxytocin during labor stimulates the smooth muscle tissue in the wall of the uterus. The vigorous contraction of the uterine smooth muscle helps push the baby through the birth canal so that delivery can occur. This process involves the interaction of which organ systems?

- A Endocrine and muscular only
- B Endocrine and reproductive only
- C Endocrine, muscular, and reproductive
- D Endocrine, reproductive, and excretory



**10** 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?

- F** A gene
- G** mRNA
- H** ATP
- J** Thymine

---

**11** During meiosis, homologous chromosomes exchange genetic material. This exchange of genetic material —

- A** increases the genetic variation
- B** reduces the diploid number to the haploid number
- C** increases the haploid number to the diploid number
- D** reduces the probability of mutations

**12** As a fertilized egg divides, the cells differentiate because they —

- F** contain a lipid bilayer
- G** can clump together
- H** metabolize sugars rapidly
- J** have specific genes activated

---

**13** The photograph shows monarch butterflies landing on plants where there are thousands of other monarch butterflies. These butterflies feed on milkweed plants as they travel south for the winter, covering distances of 5,000 km or more each year. However, the population of these butterflies has been steadily declining over the last 20 years.



© Albertotoyo/Dreamstime.com

What is the most likely reason the population of these butterflies has been declining?

- A** The number of bird species evolving to prey on butterflies has increased.
- B** The butterflies are evolving to tolerate cold weather in the northern United States and southern Canada.
- C** The increase in yearly temperatures has warmed the northern habitats.
- D** The number of milkweed plants along the butterflies' migratory route has decreased.

- 14** 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 —
- F** live in the same type of ecosystem
  - G** have slowly evolved to become herbivores
  - H** have a common ancestor
  - J** exchanged DNA at some point in the past
- 

- 15** Which statement best describes the relationship between the products of photosynthesis and the reactants in cellular respiration?
- A** The products of photosynthesis serve as the reactants in cellular respiration to provide chemical energy.
  - B** The products of photosynthesis combine with the reactants in cellular respiration to remove ATP from cells.
  - C** The products of photosynthesis inhibit the reactants in cellular respiration in the presence of light.
  - D** The products of photosynthesis change the structure of the reactants in cellular respiration in the presence of light.

- 16 Health professionals sometimes recommend nutritional supplements that contain a variety of species of bacteria to promote good digestive health. The product label for one of these supplements is shown.

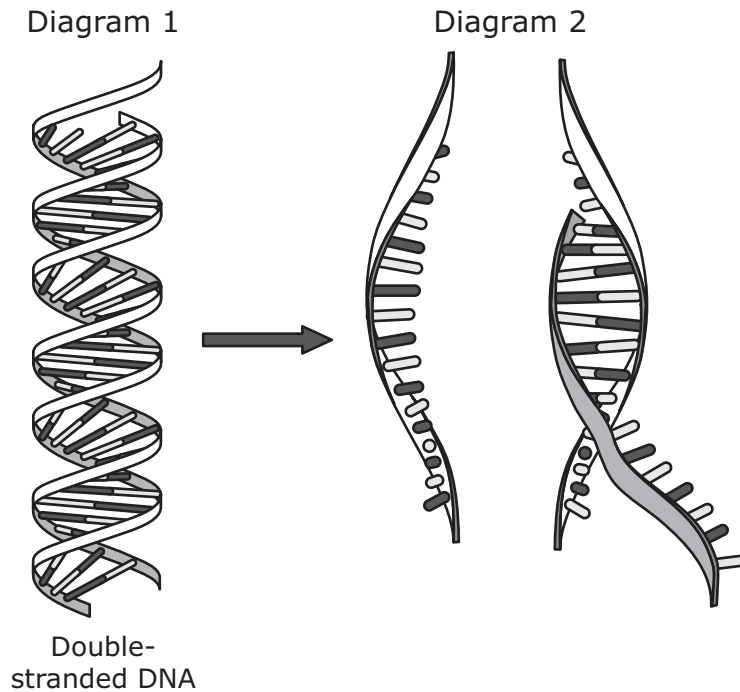
<b>Supplement Facts</b>		
Serving Size: 1 packet (3.3g)		Servings per Container: 7
	Amount Per Serving	% DV**
Calories	8	
Calories from fat	0	
Total Carbohydrate	2g	<1%
Dietary Fiber	2g	8%
Soluble Fiber	2g	***
FOS (fructooligosaccharide)	2,000mg	***
<b>Proprietary Probiotic Blend</b>		
Bifidobacterium bifidum (Bd-02)	84.5 billion	***
Lactococcus lactis (LI-23)	32.5 billion	***

\*\* Percent Daily Values are based on a 2,000-calorie diet.  
\*\*\* Daily Value not established

Why does this type of bacteria-filled supplement benefit human health instead of causing illness?

- F Stomach acids and digestive enzymes kill the bacteria in this type of supplement, protecting the person against future infections by live organisms.
- G The human digestive system contains billions of beneficial bacteria that enhance digestion and nutrient absorption, synthesize vitamins, and help limit the growth of harmful bacteria.
- H These species of bacteria remove all the other species of microorganisms living in the human digestive system and ensure that no microorganisms survive to contaminate the body.
- J These bacteria are able to deactivate viruses that may inhabit the human digestive system and are used to protect against further viral infections.

- 17** 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
- 
- 18** While visiting a national park, a student encounters an unfamiliar organism in a damp area near a body of water. The student notes that the organism is about 10 cm long, has four legs, and has a tail. The organism is black with small white spots on its smooth, moist skin. It also appears to have an internal skeletal system. To which class does the organism most likely belong?
- F** Reptilia
  - G** Amphibia
  - H** Mammalia
  - J** Insecta

- 19** During ecological succession, how does the growth of young hardwoods affect the organisms living in an ecosystem?
- A** Grasses and low shrubs are unable to obtain the amount of light they need to survive, so there are small numbers of them.
  - B** The trees provide shelter and food for a variety of mammals, insects, and birds.
  - C** In autumn, falling leaves provide a source of energy for decomposers such as fungi.
  - D** All of the above
- 

- 20** Human bone, muscle, and nerve cells all contain the same number of chromosomes with the same complement of genes. What enables these cells to perform specialized activities?
- F** The ability of some cells to remove unnecessary DNA sequences
  - G** The regulation of gene expression within each cell type
  - H** The mutation of genes within each cell type
  - J** The use of different methods of cell division

21 Some relationships between different organisms are shown in the table.

Relationship	Description
1	A lion stalks, captures, and eats a Cape buffalo.
2	A tapeworm enters the digestive system of a human and consumes the nutrients in the intestines so that they are not available to the human.
3	A cattle egret follows cattle around and eats insects disturbed by the movement of the cattle, but the cattle are unaffected.
4	A green anole and a brown anole use the same resources to survive in a vacant yard near a pond.

Which table correctly identifies each type of interaction described?

**A**

Relationship	Type of Interaction
1	Parasitism
2	Predation
3	Commensalism
4	Competition

**C**

Relationship	Type of Interaction
1	Predation
2	Parasitism
3	Competition
4	Commensalism

**B**

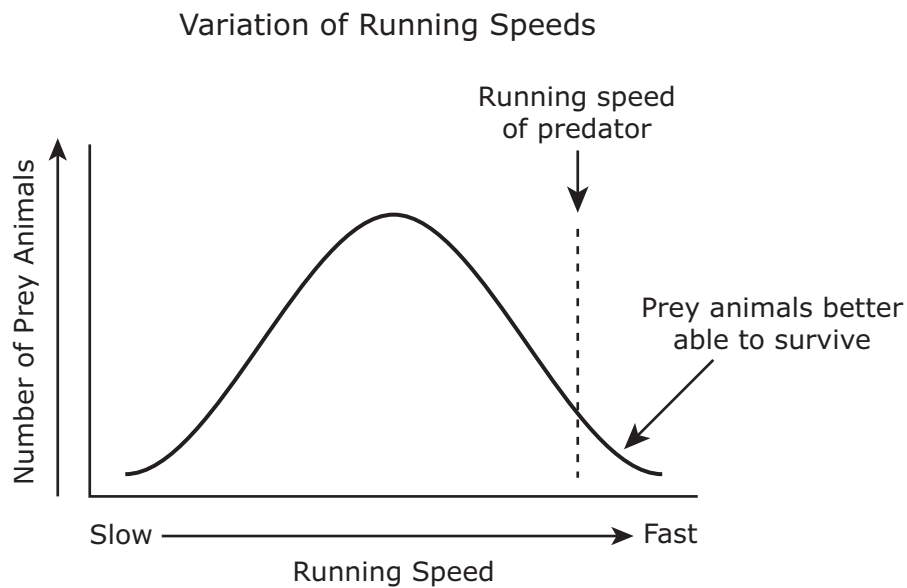
Relationship	Type of Interaction
1	Competition
2	Parasitism
3	Commensalism
4	Predation

**D**

Relationship	Type of Interaction
1	Predation
2	Parasitism
3	Commensalism
4	Competition

- 22** 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?
- F** Vascular system
  - G** Dermal system
  - H** Reproductive system
  - J** None of these
- 

- 23** A prey population consists of individuals with a variety of running speeds.

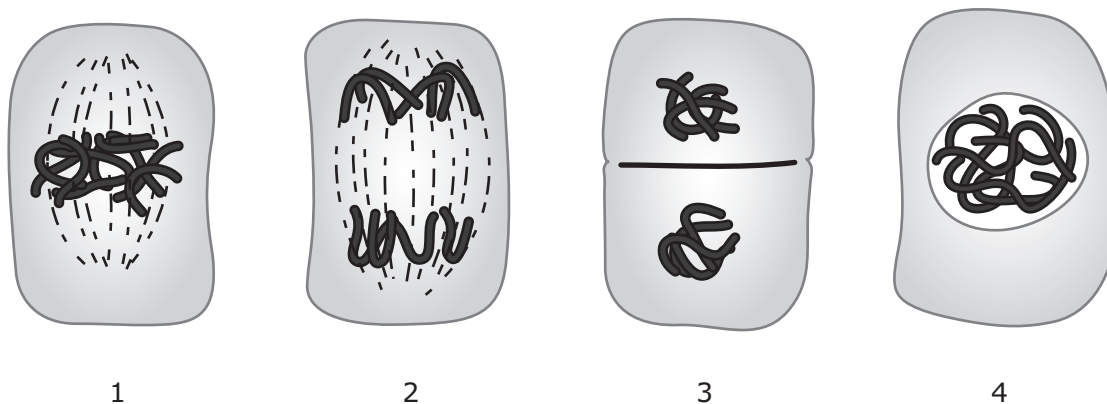


The adaptation that allows some of these animals to run fast would be an example of natural selection if it helps them —

- A** survive and undergo mutations in their DNA
- B** lower the mortality rates of the population
- C** produce offspring that run at average speeds
- D** reproduce and increase the frequency of their genes in the population



**24** The diagram shows cells in different phases of mitosis. A student is trying to find a cell in a particular phase of mitosis. The student is looking for evidence that spindle fibers are separating the chromosomes to ensure that each new nucleus has one copy of each chromosome.



Which cell is in the phase of mitosis that the student is searching for?

- F** Cell 1
- G** Cell 2
- H** Cell 3
- J** Cell 4

- 25** 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.



© iStock.com/brytta

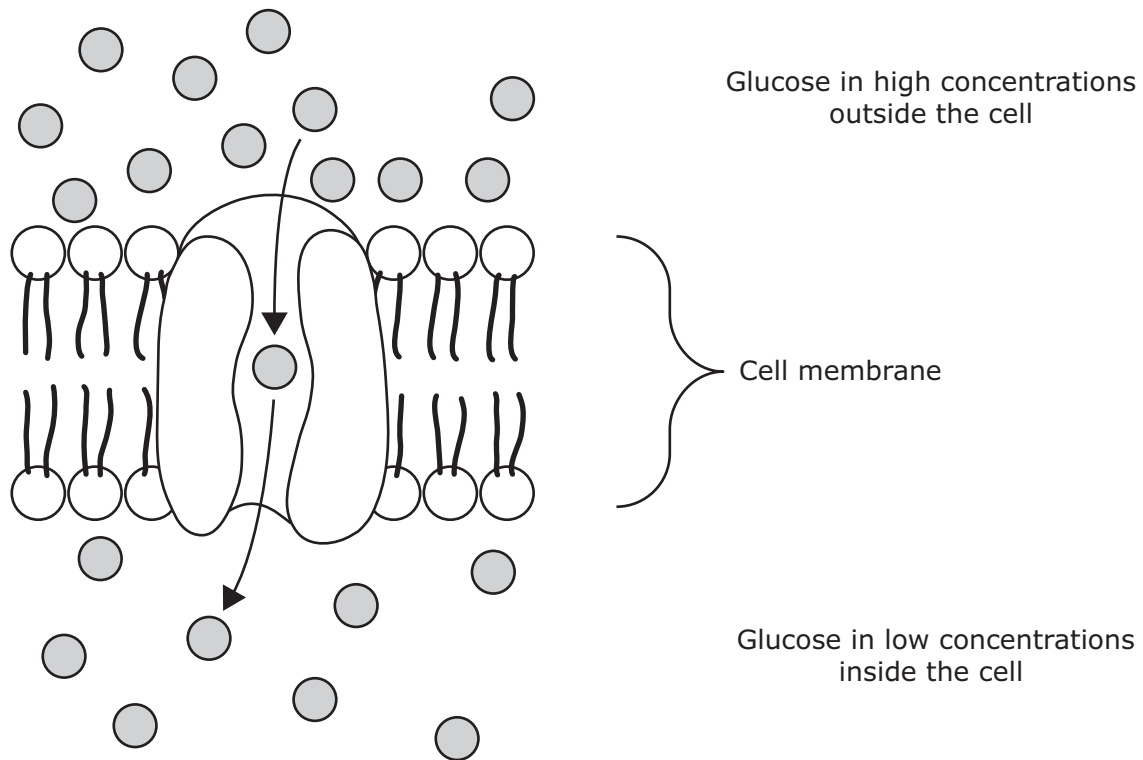
Which of these best explains what is happening to the quiver tree population in southern Africa?

- 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.

- 26** Scientists studying illnesses caused by chemically contaminated food conduct research to minimize the effects of these diseases on society. These chemicals harm the body through interactions between the digestive system and the immune system. Scientists conducting this research are likely to describe which of these interactions between the digestive and immune systems?
- F** Chemicals enter the immune system through a break in the skin. The chemical contamination is then passed to the digestive system by the circulatory system.
  - G** The immune system transforms the chemicals in the contaminated foods into harmless chemicals. These harmless chemicals are then broken down by the digestive system.
  - H** When contaminated foods are eaten, the immune system prevents the chemicals from entering the digestive system.
  - J** Chemicals enter the digestive system through contaminated foods. Once in the body, the chemical contaminants impair the body's ability to fight off infectious diseases.
- 

- 27** 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.

28 This diagram shows cellular activity across a cell membrane.



Which two processes does this diagram most directly model?

- F Energy conversions and synthesis of new molecules
- G Synthesis of new molecules and homeostasis
- H Transport of molecules and energy conversions
- J Homeostasis and transport of molecules

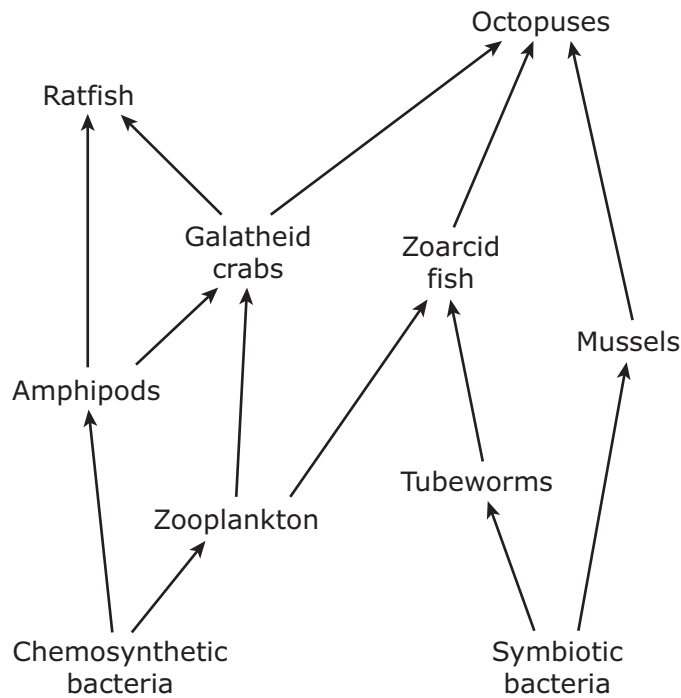
---

29 In the early 1980s scientists were able to produce two biomolecules by splicing a human gene into the bacterium *E. coli* to make recombinant human insulin and growth hormone. Which statement best explains why this experiment was successful?

- A Human cells are eukaryotic, and *E. coli* cells are prokaryotic.
- B All living organisms share the same genome.
- C The genes for all organisms are composed of the same building blocks.
- D The human body contains many types of bacteria, including *E. coli*.

- 30** Kidneys are part of the excretory system in a human body. They purify the impure blood and send it back to the rest of the body. Which system is mainly responsible for the transport of plasma to the kidneys?
- F** Respiratory system
  - G** Circulatory system
  - H** Muscular system
  - J** Nervous system
- 

- 31** 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

32 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?

**F**

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

**H**

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

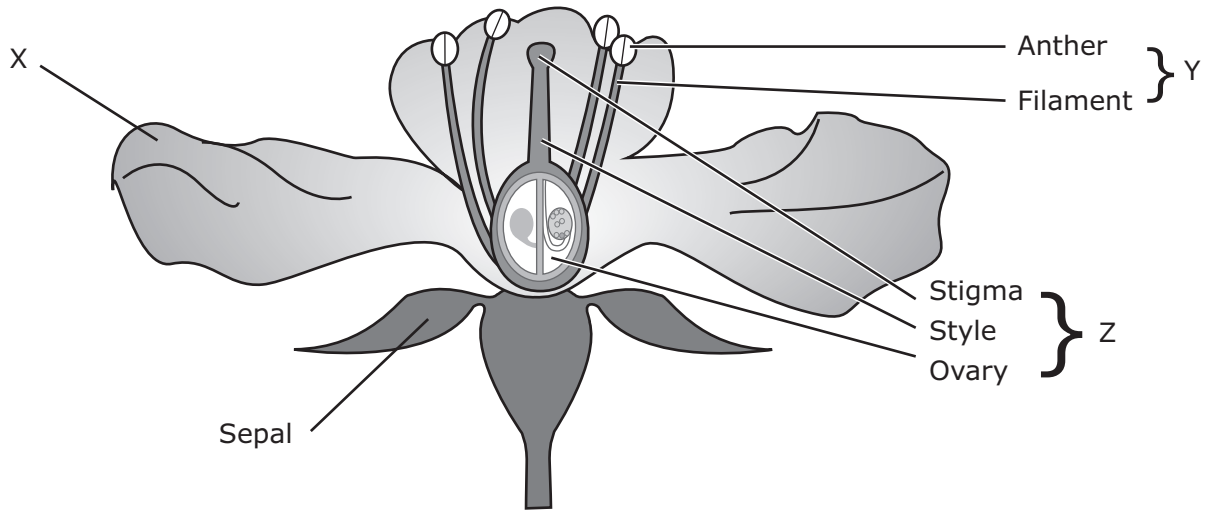
**G**

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

**J**

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

**33** Several structures work together to allow flowering plants to reproduce. The diagram shows a typical flower.



Which table correctly identifies the function of each structure or group of structures in the reproduction of the plant?

**A**

X	Pollen production
Y	Pollen transfer
Z	Production of eggs

**B**

X	Attraction of pollinators
Y	Production of male sex cells
Z	Egg production and embryo development

**C**

X	Protection for embryo
Y	Supply nourishment to embryo
Z	Place of embryonic development

**D**

X	Photosynthesis
Y	Production of cells that protect internal organs
Z	Production of egg and sperm

- 34** 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?
- F** So that another round of DNA synthesis does not have to take place
  - G** So that the chromosomes can align at the metaphase plate during mitosis
  - H** So that the cytoplasm can be divided equally between the two daughter cells
  - J** So that healthy daughter cells are produced, allowing the organism to continue growing



- 35 The table shows a DNA sequence and three types of mutations that can change the DNA sequence.

	Original	Mutation 1	Mutation 2	Mutation 3
DNA codon	TTC	ATC	TTT	TCC
mRNA codon	AAG	UAG	AAA	AGG

mRNA Codon Chart

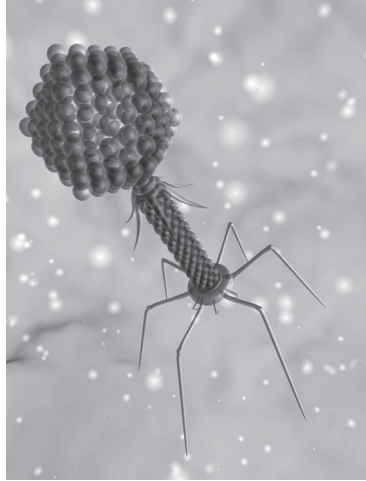
Second Position

	U		C		A		G		
	code	Amino Acid	code	Amino Acid	code	Amino Acid	code	Amino Acid	
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC		UCC		UAC		UGC		C
	UUA	Leu	UCA		UAA	STOP	UGA	STOP	A
	UUG		UCG		UAG	STOP	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	Gln	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	Lys	AGA	Arg	
	AUG	ACG	AAG		AGG		G		
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	Glu	GGA		A
	GUG		GCG		GAG		GGG		G

Which mutation will cause translation to stop?

- A Mutations 1 and 3 only
- B Mutation 1 only
- C Mutation 2 only
- D Mutations 1, 2, and 3

- 36** The picture shows a 3-D model of a virus called a bacteriophage. Bacteriophages can infect bacteria such as *E. coli*.



© Sebastian Kaultzki/Dreamstime.com

In what way are the bacteriophage and *E. coli* alike?

- F** They contain antibodies.
- G** They reproduce by mitosis.
- H** They have identical genomes.
- J** They lack membrane-bound organelles.

37 This dichotomous key can be used to identify some conifers.

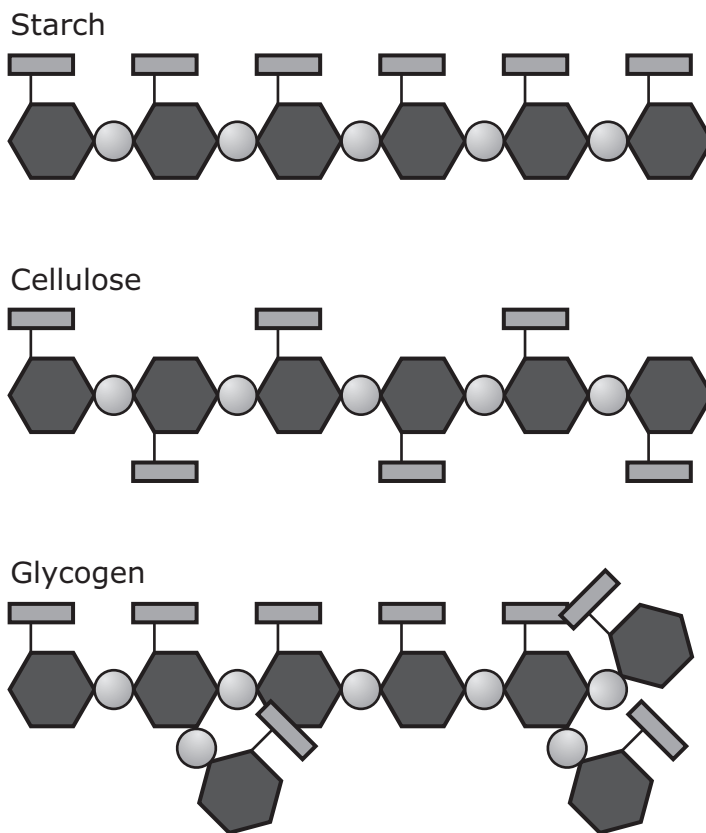
Step	Characteristic	Identification
1a	Leaves are needle-like	Go to 2
1b	Leaves are flattened and scale-like	Go to 10
2a	Leaves are in clusters	Go to 3
2b	Single leaves	Go to 9
3a	Two to five leaves in a cluster	Go to 4
3b	More than five leaves in a cluster	Go to 8
4a	Leaves mostly five in a cluster	White pine
4b	Leaves two or three in a cluster	Go to 5
5a	Leaves mostly three in a cluster	Go to 6
5b	Leaves mostly two in a cluster	Black pine
6a	Twisted leaves that are less than 13 cm long	Pitch pine
6b	Straight leaves that are more than 13 cm long	Go to 7
7a	Leaves 13 to 25 cm long; thorny cones	Loblolly pine
7b	Leaves mostly over 25 cm long; no thorns on cones	Longleaf pine
8a	Leaves in clusters of 20 to 40	Larch
8b	Leaves are stiff and four sided	True cedar
9a	Needles are short and sharp	Giant sequoia
9b	Needles are longer than 12 mm	Hemlock
10a	Soft and leathery cones	Juniper
10b	Woody cones	Cypress

Based on the key, which of these best describes the leaves and cones of the longleaf pine?

- A Needle-like straight leaves that are mostly over 25 cm long and found in clusters of three; no thorns on cones
- B Flattened and scale-like leaves that are mostly over 25 cm long; soft and leathery cones
- C Needle-like straight leaves with a length of 25 cm that are mostly found in clusters of five; thorny cones
- D Leaves with a length of 25 cm that are found in clusters of more than five; no thorns on cones

- 38** 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?
- F** BACE2 breaks down into smaller pieces that react with the abnormal protein fragments, forming more complex molecules.
  - G** BACE2 speeds up the reaction that breaks down the abnormal protein fragments.
  - H** BACE2 molecules link several abnormal protein fragments together, forming a complete protein.
  - J** BACE2 is a reactant that combines with the abnormal protein fragments.

39 The complex carbohydrates pictured below are made by linking molecules of glucose.



In all three complex carbohydrates, the subunits of glucose are bonded together differently. Because they have different structures, they most likely —

- A contain different chemical elements
- B form different proteins
- C carry different nucleotides
- D perform different functions

- 40** In 2010, scientists excavated a skull fossil that provides evidence of a newly discovered species of big cat. Based on the evidence, scientists hypothesize that big cats branched off from smaller wild cats about 6 million years ago. Which of these resources did the scientists most likely rely on to form their hypothesis?
- F** A food web showing feeding relationships of organisms where the fossil skull was found
  - G** Population and migration data for small wild cats living in the ecosystem where the skull was found
  - H** The fossil record and DNA comparisons of big cats and small cats
  - J** The historical record of interactions between different species of big cats
- 

- 41** 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

- 42** The table lists and describes three types of cells from prepared slides that students observed with a microscope.

Type of Cell	Cell Description
Squamous cell	Flat, plate-like cell that forms part of a single layer of epithelial tissue
Erythrocyte	Disk-shaped cell containing hemoglobin and lacking a nucleus
Gamete	Mobile cell containing very little cellular material except for the nucleus

Which of these sets of slides could students have used for their observations?

**F** Squamous cell: cheek cell  
Erythrocyte: skin cell  
Gamete: ovum

**H** Squamous cell: cheek cell  
Erythrocyte: red blood cell  
Gamete: sperm cell

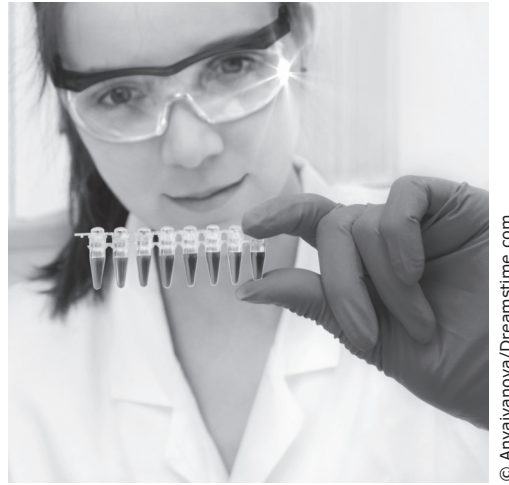
**G** Squamous cell: red blood cell  
Erythrocyte: white blood cell  
Gamete: sperm cell

**J** Squamous cell: ovum  
Erythrocyte: white blood cell  
Gamete: skin cell

- 
- 43** Which statement best describes the differences in species diversity between an ecosystem beginning the process of primary succession and one beginning the process of secondary succession?

- A** Species diversity is much greater in the ecosystem undergoing primary succession because that ecosystem is experiencing a longer period with a lack of competition for space.
- B** No differences in species diversity exist because both ecosystems initially lack living organisms.
- C** Species diversity is much greater in the ecosystem undergoing primary succession because the lack of soil provides a greater area for organisms to claim niches.
- D** Species diversity is greater in the ecosystem undergoing secondary succession because the soil already contains seeds and spores of various species.

- 44** The photograph shows a laboratory investigator examining samples of DNA in a procedure called PCR, or polymerase chain reaction. Using PCR, the investigator can create thousands or even millions of copies of a fragment of DNA for closer investigation.

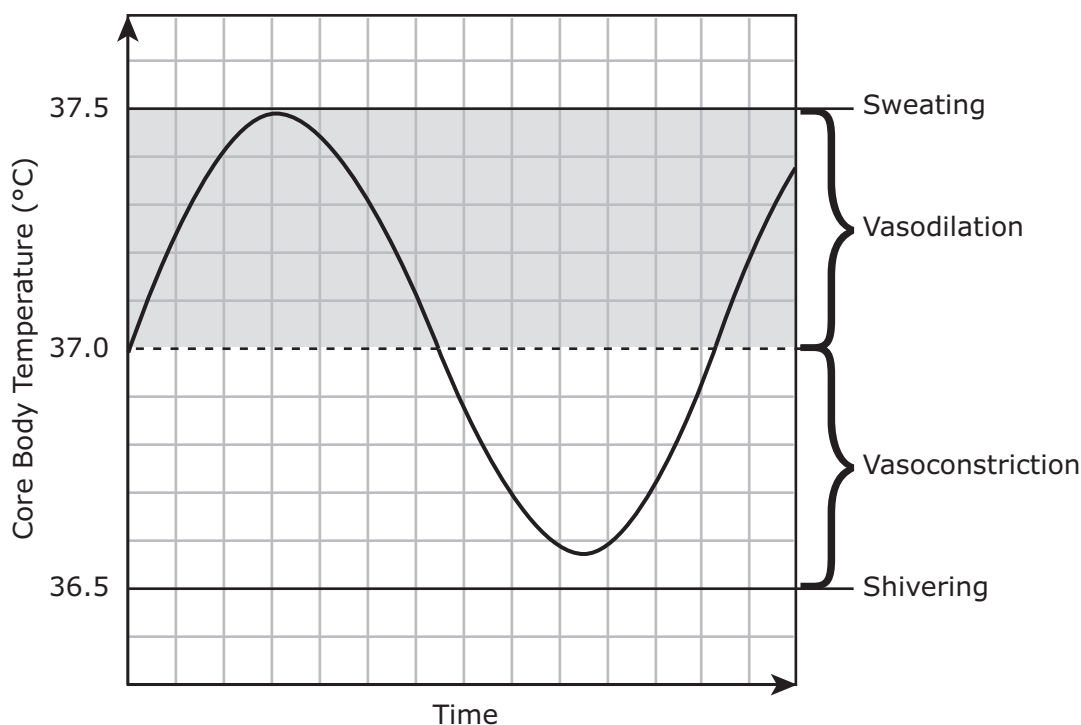


In which of these situations would PCR be most useful?

- F** When only a small amount of DNA is available, such as at a crime scene
- G** When the DNA of identical twins is being mapped
- H** When the genome of a population is being analyzed for preventable diseases
- J** When the blood type of a DNA donor is known



45 The graph models core body temperature during a rapid change in environmental conditions.



Which statement explains the pattern in the graph?

- A Body temperature varies in a predictable pattern during the day.
- B Body temperature is controlled by an internal feedback mechanism.
- C Vasodilation and vasoconstriction are dependent on the time of day.
- D Vasodilation and vasoconstriction trigger an immediate increase in body temperature.

---

46 Chickens can have different types of feathers. Frizzled feathers curl toward a chicken's head. Assume that feather type is determined by a single gene and that the allele for frizzled feathers is dominant over the allele for straight feathers. In a cross between two chickens with straight feathers, what percentage of the offspring can be expected to have frizzled feathers?

- F 0%
- G 25%
- H 50%
- J 100%

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

Nature Field Trip

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

---

48 Atmospheric nitrogen has to be combined with other elements, or fixed, in order to be used by plants. Lightning is one way that nitrogen is fixed. When lightning occurs, the extreme heat breaks the bonds in nitrogen molecules, allowing nitrogen to combine with oxygen and form nitrogen oxides. In what way is most of the nitrogen fixed by lightning made available for use by plants?

- F It is moved by the wind toward dry areas.
- G It is incorporated into the exoskeletons of flying insects that eat plants.
- H It is inhaled and exhaled by birds roosting in trees during rainstorms.
- J It is carried by rain to the soil.

- 49** Plants called sundews have rounded green leaves with many hair-like structures. The ends of these structures contain enzymes in a sticky liquid that looks like nectar or moisture, as shown in the picture. The hairs do not react to dust or nonliving material but will bend inward when insects get caught in the sticky liquid. Sundews digest trapped insects over a period of a few days.



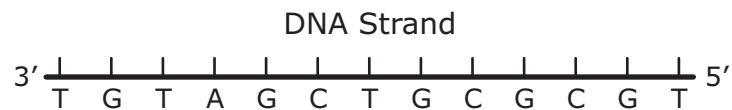
Based on this information, what functions do the specialized leaves of sundews perform?

- A** Provide water to the plant and perform photosynthesis
  - B** Respond to stimuli and anchor the plant
  - C** Provide nutrients to the plant and respond to stimuli
  - D** Release pollen to insects and perform photosynthesis
- 
- 50** Oncogenes are mutated forms of genes. Oncogenes can transform a cell into a tumor cell. Some tumor cells are benign, while others are malignant. How does the presence of an oncogene lead to the formation of a tumor?
- F** ATP production is inhibited.
  - G** Cell division is unregulated.
  - H** Somatic cell growth is inhibited.
  - J** Antibody activity is unregulated.

**51** Scientists around the world use a standardized taxonomic system. Why would scientists want to use a taxonomic system that is standardized?

- A** In order to avoid confusion with the identification of organisms
  - B** Because Linnaeus established the system
  - C** So that Latin names can be applied for a practical purpose
  - D** In order to place organisms in different groups
- 

**52** Each strand of a DNA molecule contains nitrogenous bases that pair with other nitrogenous bases in very specific ways. A diagram of a section of DNA is shown.



Which DNA strand is complementary to the one shown above?



- 53** A student performed an investigation in which two ivy plants were planted in two separate containers. One of the containers had earthworms mixed in with the soil, and the other container had soil and no earthworms. The plants were given the same amount of water and exposed to the same amount of sunlight. The student observed that after several weeks of growth, the plant exposed to earthworms appeared to be healthier and exhibited more growth. To conclude that the relationship between the plant and the earthworm is an example of mutualism, the student must perform follow-up investigations that do which of the following?
- A** Determine whether the earthworms damage the soil in any way
  - B** Determine whether the earthworms benefit from being with the plant
  - C** Determine whether the water given to the plant is unpolluted
  - D** Determine whether the other plant in the investigation suffers as a result of not being exposed to earthworms

- 54** Nudibranchs are marine gastropods that lack shells. Many of these gastropods retain the foul-tasting poisons of their prey and secrete them when threatened. The bright coloration of the nudibranchs warns predators to avoid them.

Nudibranch



Based on this information, how has adaptation allowed marine gastropods to be successful without a shell?

- F** They find enough food as they move through the marine environment.
- G** They blend in with their environment to hide from their predators.
- H** They are not attacked by most predators and are able to reproduce successfully.
- J** They have bright colors that attract a mate.

**STAAR  
Biology  
May 2016**

