Texas STAAR 2021 Biology

Exam Materials
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Answer Key Materials
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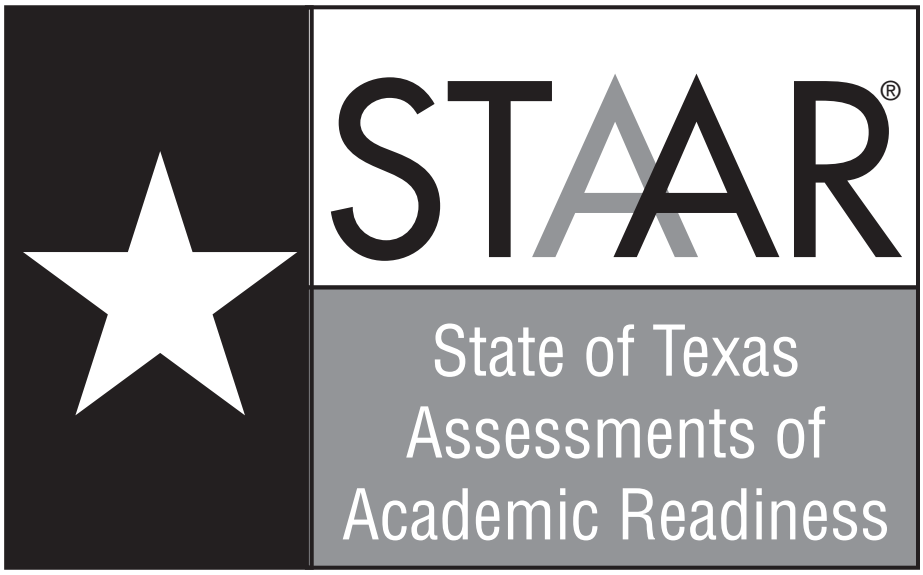

Biology

Administered May 2021

RELEASED

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 When the skin comes in contact with an irritant, receptors in the skin send signals to the spinal cord. The signal is then sent to the brain for processing, and the individual begins to scratch the affected area.

Which two systems are most likely interacting when a person experiences itching caused by a skin irritant?

A Circulatory and excretory

B Integumentary and nervous

C Digestive and muscular

D Respiratory and lymphatic

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2 During the cell cycle, proteins called cyclins bind to enzymes that send signals for the cell to progress through stages of cell replication. At the end of this cycle, the cyclins degrade to prevent further signaling for the cell to divide.

Uncontrolled production of cyclins will most likely result in —

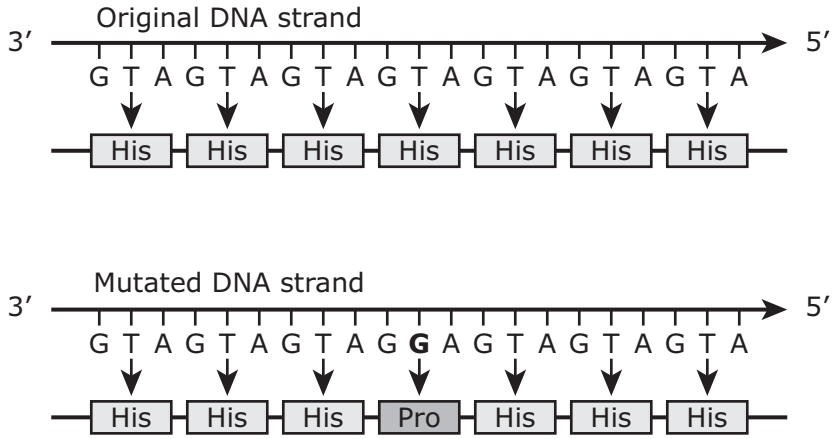
F the formation of tumors

G the immediate death of the cell

H the transfer of cyclins to other cells

J the formation of haploid cells

3 An illustration of how a particular DNA mutation will most likely affect the polypeptide produced is shown.



What type of mutation is illustrated?

A Insertion

B Translocation

C Substitution

D Deletion

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4 Farmers spray pesticides on their plants to protect the plants from being eaten by insects. Some individual insects have a genetic mutation that makes them resistant to the toxins in the pesticides.

Which statement best describes how only a few resistant individuals resulted in the pesticide becoming ineffective?

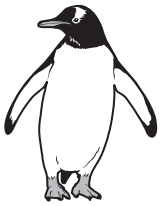
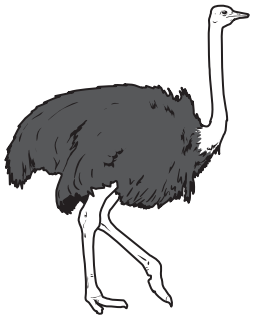
F The resistant insects change the toxin on the plants, making it safe for others.

G The resistant insects grow larger and eat less of the plants.

H The resistant insects eat the contaminated surface and leave the rest for others.

J The resistant insects are able to survive to reproduce and create a population that is also resistant.

5 The defenses of two flightless birds that live in different habitats are shown.

	Gentoo Penguin	Common Ostrich
Picture		
Habitat	Antarctic islands	African savanna
Defenses	Wings are flattened and tapered, like paddles, allowing penguins to swim and jump out of water at speeds up to 22 km/h.	Leg muscles are located closer to the body, allowing ostriches to run at speeds up to 70 km/h.

How do the wings of the Gentoo penguin and the legs of the common ostrich provide an advantage in their habitat?

A Allows them to find prey

B Allows them to escape from predators

C Allows them to control their body temperature

D Allows them to be camouflaged in their environments

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6 Which property is shared by the cells of all living things?

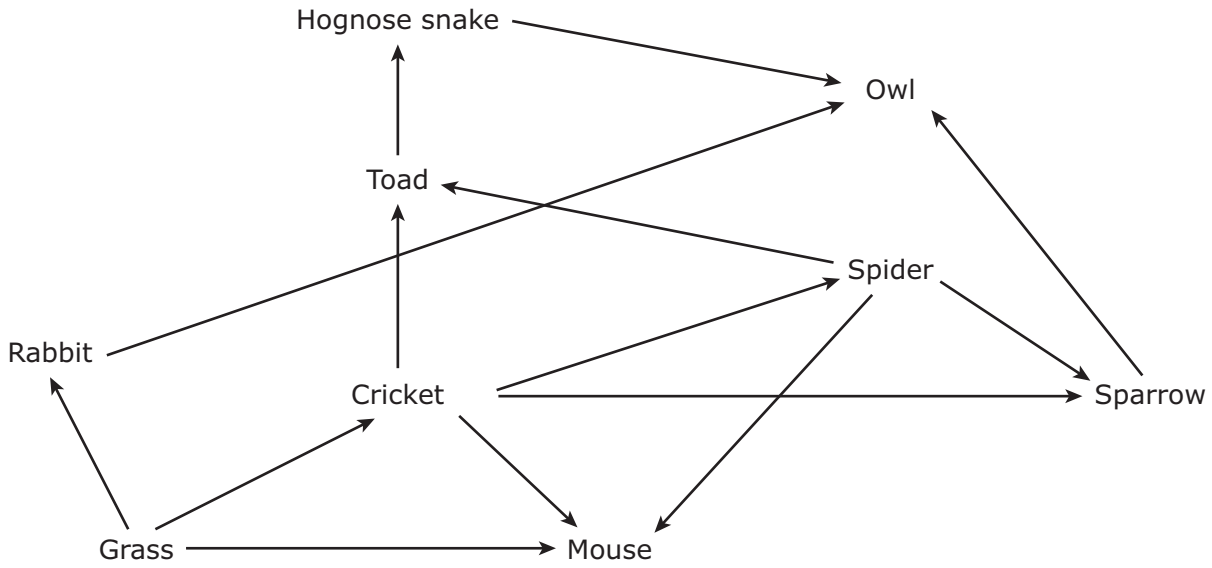
F The cells contain DNA composed of adenine, thymine, guanine, and cytosine.

G The cells are surrounded by a phospholipid bilayer and a cell wall made of cellulose.

H The cells have chromosomes that are located inside a membrane-bound nucleus.

J The cells rely on mitochondria to carry out aerobic cellular respiration.

7 The flow of energy in a grassland ecosystem is shown.



Based on the diagram, which two populations best represent trophic levels that receive the LEAST amount of the total energy provided to the ecosystem by the grass?

A Crickets and sparrows

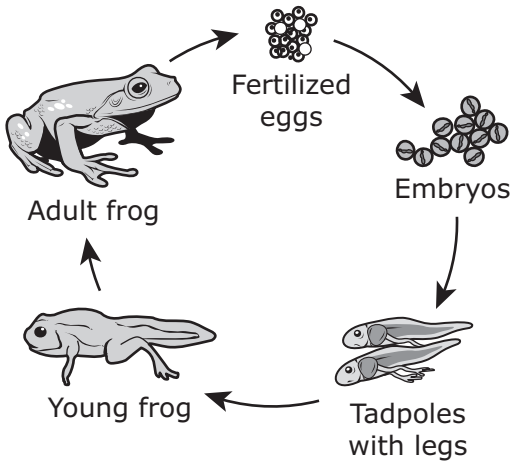
B Toads and spiders

C Rabbits and mice

D Hognose snakes and owls

GO ON

8 The life cycle of a frog is illustrated in the diagram.



Which statement best explains how the cell cycle is important to the life cycle of the frog?

F It enables frogs to produce tadpoles that are clones.

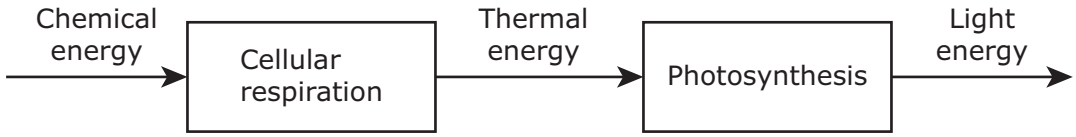
G It allows frogs to grow, develop, and reproduce.

H It prevents overproduction of frog offspring.

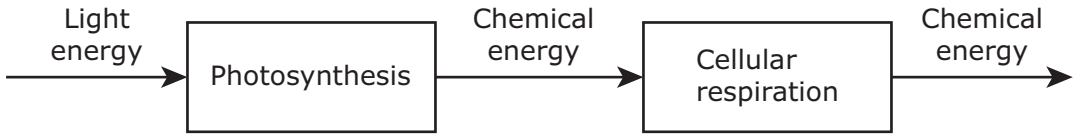
J It ensures the best adapted frogs survive and pass on traits to offspring.

9 Which graphic organizer best compares the energy inputs and outputs of cellular respiration and photosynthesis?

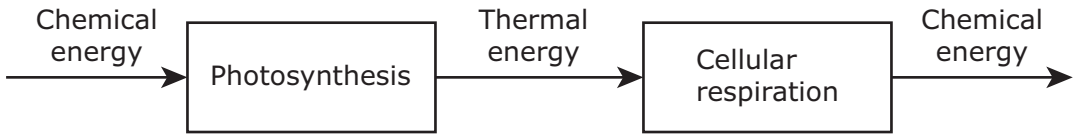
A



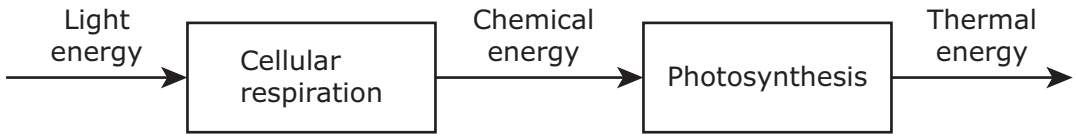
B



C



D



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10 Overfishing is causing the decline of fish populations, such as Eastern Atlantic bluefin tuna in the Mediterranean. Eastern Atlantic bluefin tuna are caught faster than they can reproduce.

Which statement describes the most likely effect that overfishing will have on this ecosystem?

F Overfishing makes the ecosystem more stable by increasing competition for limited resources.

G Overfishing decreases the stability of the ecosystem by disrupting food chains.

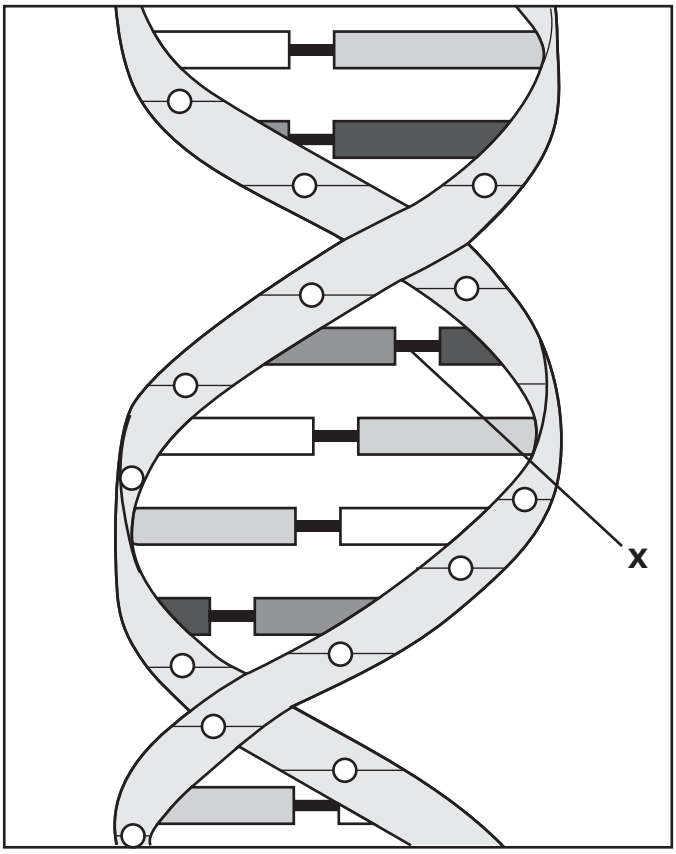
H Overfishing has no effect on ecosystem's stability because it affects one species out of many.

J Overfishing increases ecosystem stability by allowing prey populations to overproduce.

GO ON

11 A segment of DNA is shown in the diagram.

DNA Segment



Which of these identifies the part of the DNA segment labeled X?

A Nucleotide

B Phosphate group

C Hydrogen bond

D Deoxyribose

12 Which statements best compare the function of an ATP molecule to a DNA molecule?

F ATP carries and transmits the genetic information of organisms.
DNA serves as a biological catalyst that speeds up the rate of chemical reactions.

G ATP provides energy for chemical reactions in the cell.
DNA carries and transmits the genetic information of organisms.

H ATP serves as a biological catalyst that speeds up the rate of chemical reactions.
DNA acts as a structural sugar in the cell walls of plants.

J ATP acts as a structural sugar in the cell walls of plants.
DNA provides energy for chemical reactions in the cell.

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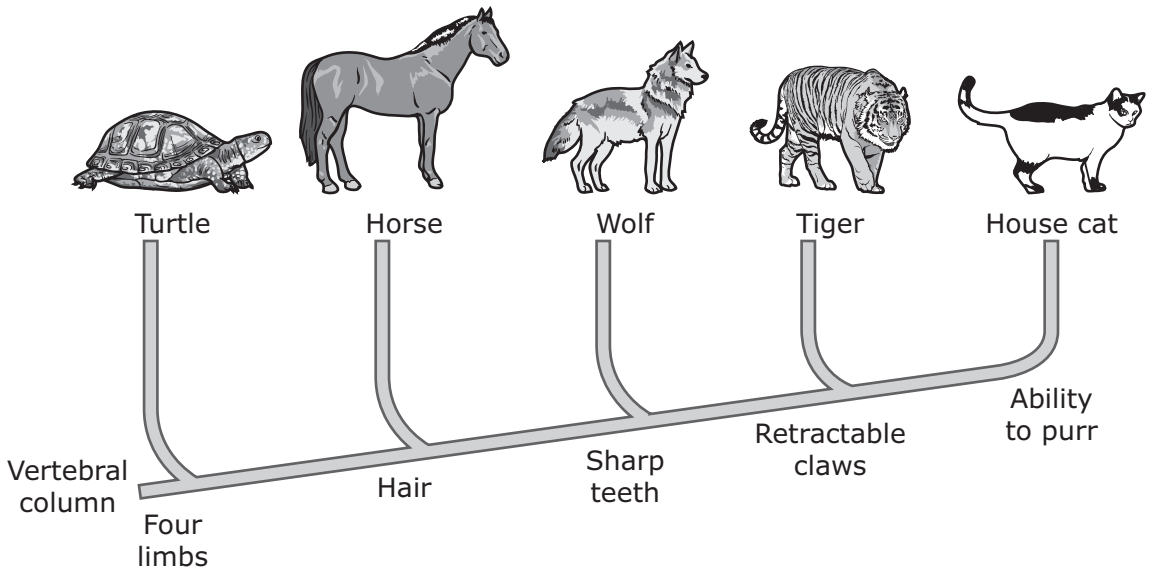
13 A cladogram of five species is shown.



Based on the cladogram, the ancestral species most likely had —

A a vertebral column

B a vertebral column and hair

C sharp teeth and retractable claws

D the ability to purr

GO ON

14 Students created note cards comparing characteristics of eukaryotic and prokaryotic cells. Which set of note cards most accurately compares these cells?

F

Eukaryotic Cells	Prokaryotic Cells
• Membrane-bound nucleus or organelles • DNA chromosomes in the nucleus	• No nucleus or other membrane-bound organelles • DNA chromosome in the cytoplasm

G

Eukaryotic Cells	Prokaryotic Cells
• Membrane-bound nucleus or organelles • DNA chromosomes in the cytoplasm	• No nucleus or other membrane-bound organelles • DNA chromosome in the cytoplasm

H

Eukaryotic Cells	Prokaryotic Cells
• No membrane-bound nucleus or organelles • DNA chromosomes in the cytoplasm	• Membrane-bound nucleus or organelles • DNA chromosome in the nucleus

J

Eukaryotic Cells	Prokaryotic Cells
• No membrane-bound nucleus or organelles • DNA chromosomes in the nucleus	• Membrane-bound nucleus or organelles • DNA chromosome in the nucleus

15 The Mexican long-nosed bat roosts in Big Bend National Park in West Texas. The bat feeds on nectar and pollen and hovers while it feeds. Additionally, its tongue can extend up to eight centimeters.

The features of Mexican long-nosed bats are evidence of natural selection because the features are adaptations that —

A lead to an increase in predation by other species of animals

B show that most DNA mutations are necessary and advantageous but do not increase survival or reproductive success

C help individuals outcompete other individuals for food resources to increase survival and reproductive success

D are the result of intentional breeding

---

16 Which statement describes the process of osmosis in an animal cell?

F Sugar molecules move across the plasma membrane until the cell has enough energy to grow in size and divide.

G Water molecules move across the plasma membrane until solute concentrations are equal on both sides of the membrane.

H Ions move across the plasma membrane until the inside of the cell has a higher concentration of positive charges.

J Enzymes move across the plasma membrane until the cell has completed metabolism.

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17 Sand dunes along the coast are formed of bare sand. Eventually, grasses take root on the dunes. Over time, larger plants such as shrubs and trees are able to grow at the edge of the sand dune ecosystem.

This gradual change in plant communities of a sand dune ecosystem can result in —

A reduced symbiotic relationships between producers and bacteria

B reduced energy absorption by consumers

C greater erosion rates

D greater species diversity

18 A researcher determines an organism to be eukaryotic, unicellular, and autotrophic. In which taxonomic group should this organism be classified?

F Bacteria

G Protista

H Archaea

J Animalia

---

19 For an enzyme to be able to catalyze a reaction, the active site must —

A be occupied by an inhibitor

B increase the activation energy level

C have a complementary shape to the substrate

D cause the enzyme to be destroyed in the reaction

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20 Snowshoe hares can be found living in the Rocky Mountains of New Mexico. During the summer months, when there is no snow on the ground, the snowshoe hare's coat color is typically brown. During the winter months, when the mountains are covered in snow, the snowshoe hare's coat is typically white.

Which statement describes the genetic basis for the seasonal changes in coat color?

F The snow causes mutations in the genes that regulate coat color so that snowshoe hares are adapted to their environment during the winter months.

G The genes that control coat color are regulated by hormone signals that are altered by changes in environmental factors.

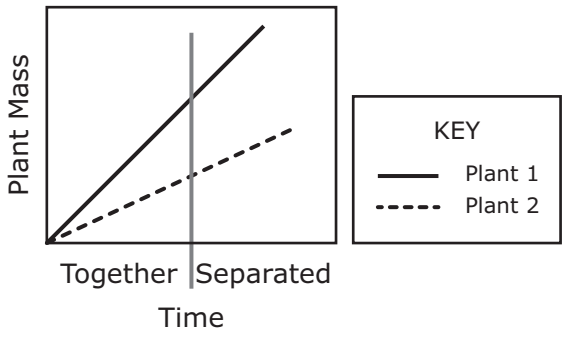
H Sunlight causes cancer cells to develop in the bodies of snowshoe hares, resulting in an apparent brown-colored coat as a result of hair loss.

J The genes that control coat color in snowshoe hares are deleted from the genome during the summer months.

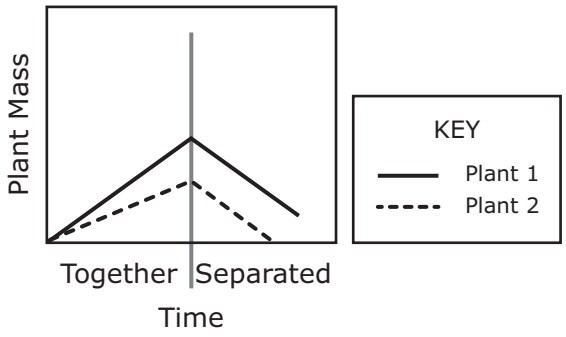
21 In an experiment, two plants are grown together for a time and then separated. Plant 2 is a parasite of Plant 1.

Which graph best predicts the growth of Plant 1 and Plant 2 during the experiment?

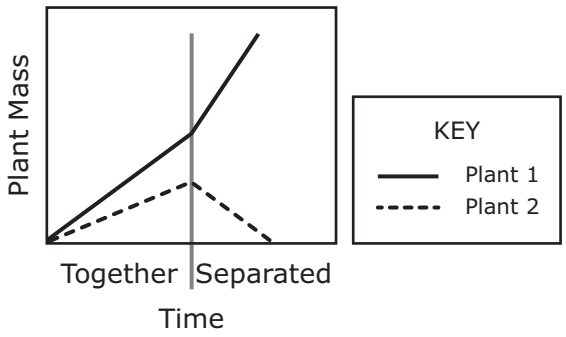
A



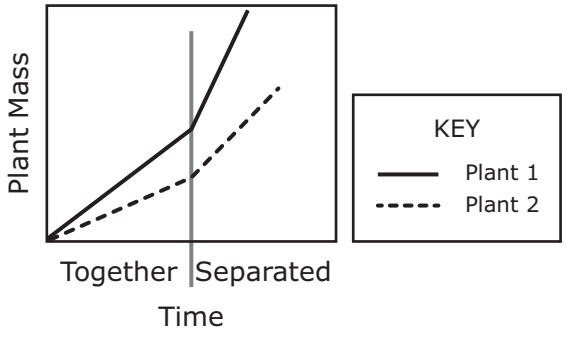
B



C



D



GO ON

22 When multiple transitional fossils are found in many rock layers, they provide evidence of —

F seasonal variation in the diet of a species

G gradual change of a species over time

H DNA functioning as the genetic material of organisms

J an unchanging environment

---

23 Environmental factors typically activate genes in a cell by causing the cell to —

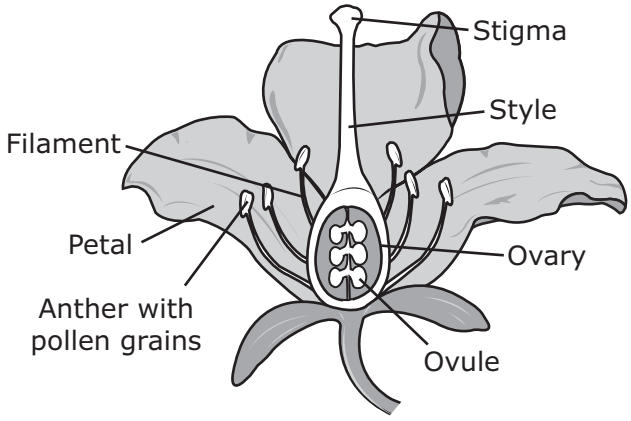
A produce identical daughter cells through mitosis

B form haploid gamete cells through meiosis

C fuse with another cell to increase the size of its genome

D transcribe specific DNA segments to mRNA for translation

24 A flower that has both male and female reproductive structures is shown.



Which statement best describes an interaction that will allow a flowering plant to reproduce by self-pollination?

F An anther is transferred from a filament to another filament within the same flower.

G An ovule is transferred from the ovary to a petal on a different flower.

H A pollen grain is transferred from an anther to the stigma of the same flower.

J An ovary is transferred from a flower on one plant to a flower on a different plant.

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25 A genetic cross involving two unlinked genes is represented.

AaGG x aaGg

Which genotype is NOT possible in the offspring produced by the cross?

A AaGG

B Aagg

C aaGg

D aaGG

26 Breaking down food for nutrients involves many body systems. A student made a partial list of the processes that occur.

- Salivary enzymes begin to break down starch molecules in food.
- Gastrointestinal enzymes are released in response to a hormone signal.
- Nutrients are absorbed into the bloodstream from the small intestine.

Which body systems interact most directly in the three listed processes?

F Digestive
Integumentary
Muscular

G Excretory
Immune
Muscular

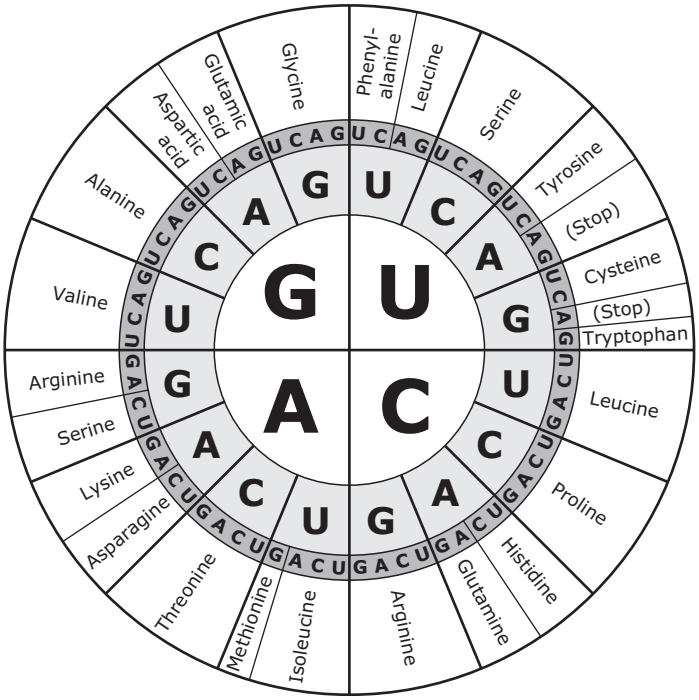
H Circulatory
Excretory
Immune

J Circulatory
Digestive
Endocrine

27 A partial DNA segment and an mRNA codon chart are shown.

3′ T C A T G C A T G 5′

mRNA Codon Chart



What amino acid sequence is encoded in the partial DNA segment?

A Serine – Threonine – Tyrosine

B Serine – Serine – Tyrosine

C Serine – Threonine – Methionine

D Serine – Alanine – Methionine

GO ON

28 A farmer is struggling to control the population of a certain insect on his farm. After researching population control techniques, he discovers that a particular bird is a predator of this insect. The farmer purchases a number of these birds and releases them onto his farm.

How might the farmer's action most likely have a negative impact on the ecosystem?

F The birds will increase biodiversity of native plant species.

G The birds will pollinate native species, increasing genetic variation.

H The birds will consume beneficial insects, as well as the pest species.

J The birds will mate with native birds and create a new species.

29 Students examine images of a certain species of bat commonly found in Texas. Using the bat dichotomous key, they conclude that the bat species is a Mexican free-tailed bat due to its large, round ears.

Bat Dichotomous Key

1a	Solitary bat	Go to 2
1b	Colonial bat	Go to 3
2a	>35-cm wingspan	Hoary bat
2b	<35-cm wingspan	Go to 4
3a	>35-cm wingspan	Big brown bat
3b	<35-cm wingspan	Go to 5
4a	Reddish brown colored fur	Seminole bat
4b	Light colored fur	Eastern red bat
5a	Large, round ears	Mexican free-tailed bat
5b	Short, pointy ears	Cave myotis bat

Based on the dichotomous key, in addition to the shape of the bat's ears, which other set of features should the students look for to confirm the identity of the bat?

A Solitary with a wingspan greater than 35 cm

B Solitary with a wingspan less than 35 cm

C Colonial with a wingspan greater than 35 cm

D Colonial with a wingspan less than 35 cm

30 Materials are provided to students to build models of a prokaryotic cell, a eukaryotic cell, and a virus. The materials and the structures they represent are listed in the table shown.

Material	Structure Represented
Gray paper hexagon	Capsid
Yellow paper oval	Cytoplasm
Purple buttons	Ribosomes
Blue yarn	Genetic material
Orange paper circle	Nucleus

Which material will students use in all three models?

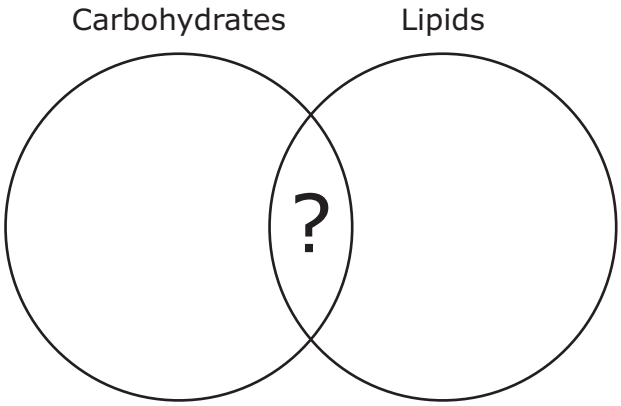
F Yellow paper oval

G Gray paper hexagon

H Blue yarn

J Purple buttons

31 A student makes a Venn diagram to compare the functions of carbohydrates and lipids.



Which cellular function of carbohydrates and lipids should be placed in the shared section of the Venn diagram?

A Hormone production

B Structural support of cell walls

C Energy storage

D Catalyst for chemical reactions

---

32 Which statement is an example of how carbon moves through a food chain as part of the carbon cycle?

F Producers release carbon dioxide, and consumers take it in.

G Producers take in carbon dioxide, and consumers release it.

H Producers take in carbon from the soil, and they release it when they decompose.

J Producers release carbon into the soil, and consumers take it in from the soil.

33 Which table correctly identifies how the plasma membrane contributes to the maintenance of cellular homeostasis?

A

Function	Yes	No
Controls materials that enter and exit the cell	X	
Converts ATP to glucose for energy storage		X
Catalyzes protein synthesis		X
Receives signals for DNA replication		X

B

Function	Yes	No
Controls materials that enter and exit the cell		X
Converts ATP to glucose for energy storage		X
Catalyzes protein synthesis	X	
Receives signals for DNA replication		X

C

Function	Yes	No
Controls materials that enter and exit the cell		X
Converts ATP to glucose for energy storage	X	
Catalyzes protein synthesis		X
Receives signals for DNA replication	X	

D

Function	Yes	No
Controls materials that enter and exit the cell		X
Converts ATP to glucose for energy storage		X
Catalyzes protein synthesis	X	
Receives signals for DNA replication	X	

34 In Texas Longhorn cattle, coat coloration is an inherited trait. What is the genetic basis of coat-color variation in Texas Longhorn cattle?

F Differences in the nucleotide sequences of genes

G Differences in the numbers of chromosomes in cells

H Differences in the diets of individual cattle

J Differences in the environmental conditions of different geographic areas

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35 The taxonomic classifications of four species of amphibians are shown.

	Northern Cricket Frog	Northern Leopard Frog	Green Treefrog	Bullfrog
Order	Anura	Anura	Anura	Anura
Family	Hylidae	Ranidae	Hylidae	Ranidae
Genus	*Acris*	*Lithobates*	*Hyla*	*Lithobates*
Species	*crepitans*	*pipiens*	*cinerea*	*catesbeianus*

Based on the information provided, which two species are most closely related?

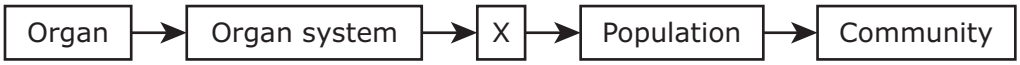
A Northern cricket frog and bullfrog

B Northern leopard frog and green treefrog

C Northern cricket frog and green treefrog

D Northern leopard frog and bullfrog

36 Students construct a graphic organizer to illustrate the different levels of biological organization.



Which term does the letter X represent in the graphic organizer?

F Cell

G Organism

H Ecosystem

J Biosphere

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37 When a new mutation occurs in a somatic cell of a sexually reproducing organism, what percentage of the individual's offspring are likely to inherit the mutation?

A 100%

B 75%

C 25%

D 0%

38 Researchers have observed striped hyenas and gray wolves hunting together in certain areas. One hypothesis suggests that changing hunting behavior aids both species in obtaining better and more resources. In this hypothesis the hyenas benefit because the wolves chase and take down large animals, such as goats, that the hyenas usually cannot catch alone. The wolves benefit from hyenas using their jaw strength to crack open large bones of prey to access additional nutrients from bone marrow.

Which table best identifies the ecological relationships among the gray wolf, hyena, and goats?

F

Organisms Involved	Relationship
Hyenas and gray wolves	Predator-prey
Gray wolves and goats	Commensalism

G

Organisms Involved	Relationship
Hyenas and gray wolves	Mutualism
Gray wolves and goats	Predator-prey

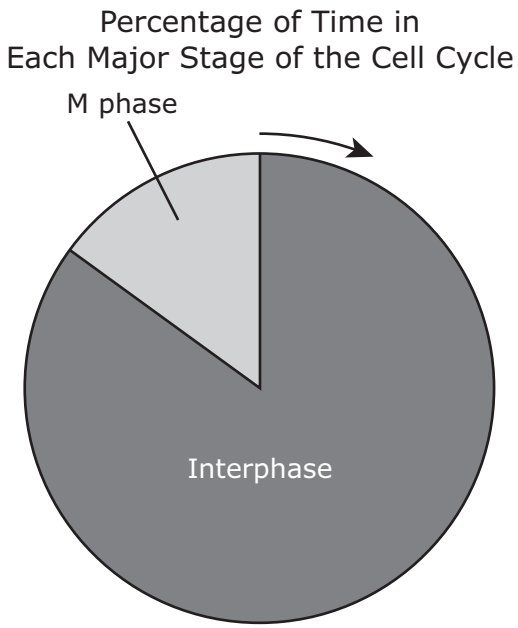
H

Organisms Involved	Relationship
Hyenas and gray wolves	Parasitism
Gray wolves and goats	Mutualism

J

Organisms Involved	Relationship
Hyenas and gray wolves	Commensalism
Gray wolves and goats	Parasitism

39 The diagram shows the major stages of the cell cycle and the percentage of time spent in each phase.



Which statement best describes why a cell spends the majority of its time in interphase?

A The cell is growing and carrying out processes such as metabolism and DNA replication.

B The cell is aging and processes are stopping as lysosomes clear dead cell matter away.

C The cell needs time to synthesize spindle fibers to complete mitosis.

D The cell needs time to complete cytokinesis.

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40 The giant octopus lays 20,000 to 100,000 fertilized eggs. After hatching, most octopuses become prey to larger marine organisms, and less than 5% will reach adulthood to reproduce.

One benefit of the giant octopus laying many eggs is to —

F increase the average body size for surviving individuals to avoid predation

G decrease competition between different octopus species to maintain resources in the population

H increase the chance that more individuals will survive to maintain the population

J decrease the likelihood of offspring being consumed by predators

41 Some angelfish colors are determined by codominance. Possible phenotypes and genotypes of angelfish colors are shown.

Phenotype	Genotype
 Silver	LL
 Black	BB
 Black lace	BL

Which table shows the expected phenotypes of offspring resulting from a cross between a black angelfish and a black-lace angelfish?

A

Phenotype	Silver	Black	Black Lace
Phenotypic probability of offspring	—	50%	50%

B

Phenotype	Silver	Black	Black Lace
Phenotypic probability of offspring	50%	50%	—

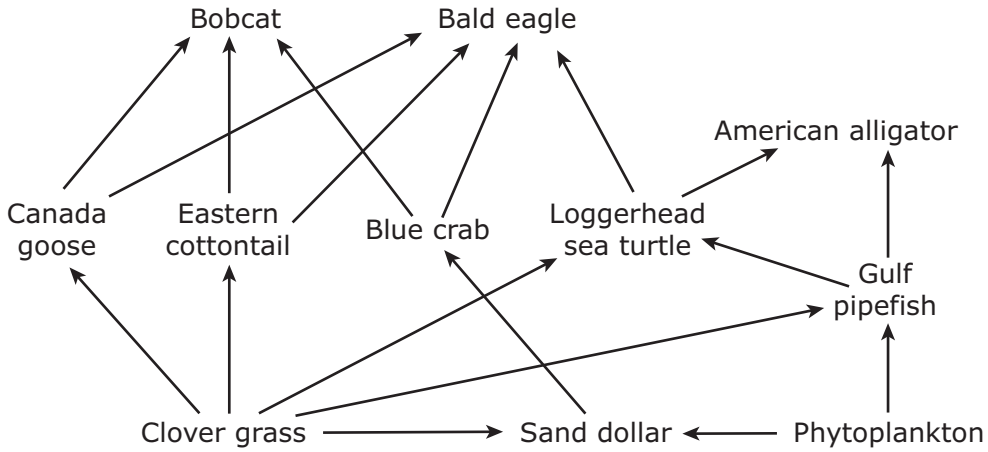
C

Phenotype	Silver	Black	Black Lace
Phenotypic probability of offspring	25%	25%	50%

D

Phenotype	Silver	Black	Black Lace
Phenotypic probability of offspring	25%	50%	25%

42 A food web representing a Gulf Coast ecosystem is shown.



Based on this food web, which organism occupies multiple trophic levels?

F Canada goose

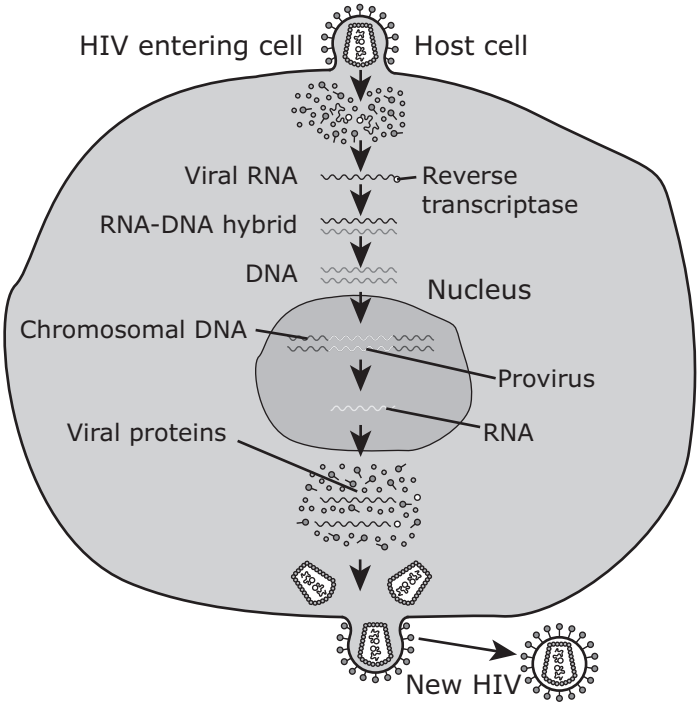
G Eastern cottontail

H Loggerhead sea turtle

J Sand dollar

GO ON

43 A diagram of an HIV infection is shown.



Which conclusion about the HIV infection of a host cell is best supported by the diagram?

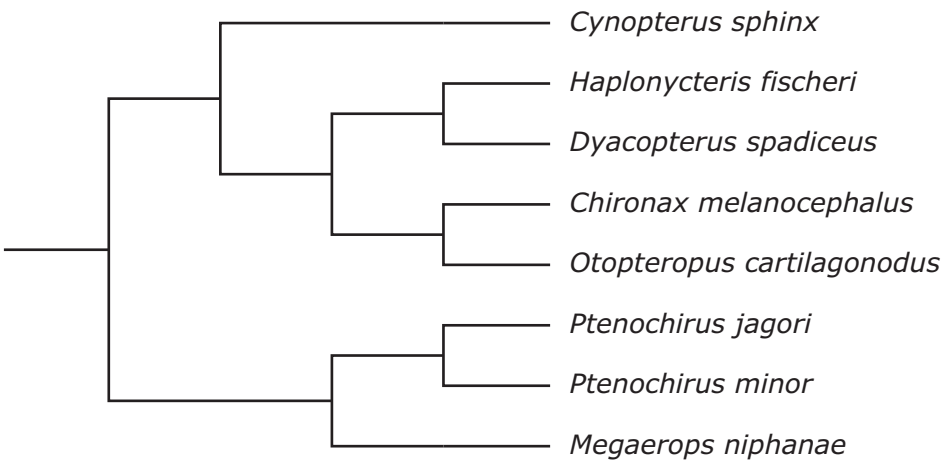
A It takes place outside of living cells.

B It relies on the host cell to reproduce.

C It involves the process of meiosis.

D It requires carbon dioxide.

44 Researchers analyzed a mitochondrial gene of different bat species to determine relatedness. A cladogram of their results is shown.



Based on the cladogram, which set of bat species is the least related?

F *Ptenochirus minor and Megaerops niphanae*

G *Dyacopterus spadiceus and Otopteropus cartilagonodus*

H *Haplonycteris fischeri and Ptenochirus jagori*

J *Cynopterus sphinx and Chironax melanocephalus*

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45 Which statement best describes how bacteria recycle matter in an ecosystem?

A Bacteria are producers that create energy for second-order consumers.

B Bacteria produce toxins to prevent the growth of invasive species.

C Bacteria cause diseases that limit the reproduction of organisms in a population.

D Bacteria are decomposers that help to transfer organic material to the soil.

46 Students set up a controlled experiment by growing the same type of seedlings in two different locations. After a period of time, the students observed the seedlings and recorded their observations in the table shown.

	Group #1	Group #2
Growth Location	Enclosed in a box with a lamp on top of seedlings	On the windowsill
Observation	Shoots grow straight and upright	Shoots bend in the direction of the window

What caused the shoots of the seedlings on the windowsill to bend toward the window?

F Hormones produced in response to a light stimulus

G Sugars produced in response to a gravity stimulus

H Carbon dioxide produced in response to a water stimulus

J Water produced in response to a nitrogen stimulus

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47 An illness caused by a certain virus includes fever, rash, joint pain, red eyes, and headache. The virus is transmitted to people by infected mosquitoes. Symptoms quickly occur within three to twelve days after contracting the virus. There is no vaccine for this virus.

Which description best explains the reproductive cycle of this virus?

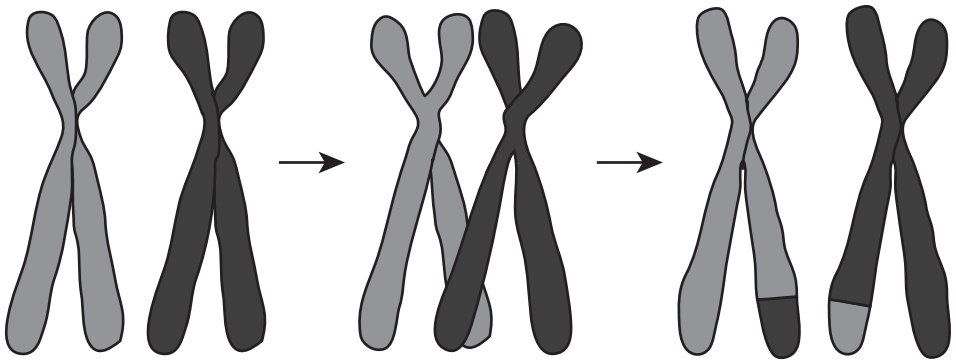
A Lytic, because the virus is transmitted by mosquitoes

B Lysogenic, because there is no way to vaccinate against it

C Lytic, because of the quick incubation time

D Lysogenic, because the virus causes a fever

48 A cellular process is shown.



Which statement best describes the significance of this process?

F The process allows organisms to grow and heal.

G The process produces clones of the parent organism.

H The process copies DNA before cell division.

J The process creates genetic variation in the resulting cells.

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49 Which statement best describes an interaction between the muscular system and the respiratory system?

A The hormone adrenaline causes blood vessels to contract and send more blood to major muscles.

B Metabolic wastes generated by muscle cells are eliminated in urine.

C The diaphragm contracts causing the chest cavity to expand, which draws air into the lungs.

D Nutrients absorbed in the small intestine are transported in blood to the brain.

50 Two scientists want to compare their research of fireflies. Which information must the two scientists provide to each other to determine if they studied the same type of fireflies?

F Size of the firefly populations

G Type of habitat in which the fireflies live

H Color of light produced by the fireflies

J Species name of the fireflies studied

BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS ON THE ANSWER DOCUMENT.

Item Number	Reporting Category	Readiness or Supporting	Content Student Expectation	Process Student Expectation	Correct Answer
1	4	Readiness	B.10(A)	B.3(A)	B
2	1	Supporting	B.5(C)		F
3	2	Readiness	B.6(E)	B.2(G)	C
4	3	Supporting	B.7(C)		J
5	5	Supporting	B.12(B)	B.2(G)	B
6	2	Supporting	B.6(B)		F
7	5	Readiness	B.12(C)	B.2(G)	D
8	1	Readiness	B.5(A)		G
9	4	Supporting	B.9(B)	B.2(H)	B
10	5	Readiness	B.12(E)		G
11	2	Readiness	B.6(A)		C
12	4	Readiness	B.9(A)		G
13	3	Readiness	B.7(A)	B.2(H)	A
14	1	Supporting	B.4(A)	B.2(H)	F
15	3	Readiness	B.7(E)	B.3(A)	C
16	1	Readiness	B.4(B)		G
17	5	Readiness	B.11(B)		D
18	3	Supporting	B.8(C)	B.2(G)	G
19	4	Supporting	B.9(C)		C
20	2	Supporting	B.6(D)	B.3(A)	G
21	5	Readiness	B.12(A)	B.2(G)	C
22	3	Supporting	B.7(B)	B.3(A)	G
23	1	Supporting	B.5(B)		D
24	4	Readiness	B.10(B)	B.2(H)	H
25	2	Readiness	B.6(F)	B.2(H)	B
26	4	Readiness	B.10(A)		J
27	2	Supporting	B.6(C)	B.2(G)	A
28	5	Readiness	B.12(E)		H
29	3	Readiness	B.8(B)	B.2(H)	D
30	1	Readiness	B.4(C)	B.3(E)	H
31	4	Readiness	B.9(A)	B.2(H)	C
32	5	Supporting	B.12(D)		G
33	1	Readiness	B.4(B)	B.2(H)	A
34	2	Readiness	B.6(A)		F
35	3	Readiness	B.8(B)	B.2(G)	D
36	4	Supporting	B.10(C)	B.2(H)	G
37	2	Readiness	B.6(E)		D
38	5	Readiness	B.12(A)		G
39	1	Readiness	B.5(A)	B.2(H)	A
40	3	Supporting	B.7(D)		H
41	2	Readiness	B.6(F)	B.2(G)	A
42	5	Readiness	B.12(C)	B.2(G)	H
43	1	Readiness	B.4(C)	B.2(H)	B
44	3	Readiness	B.7(A)	B.2(H)	H
45	5	Supporting	B.11(A)		D
46	4	Readiness	B.10(B)	B.2(E)	F
47	1	Readiness	B.4(C)		C
48	2	Supporting	B.6(G)		J
49	4	Readiness	B.10(A)		C
50	3	Supporting	B.8(A)		J

2021 STAAR Biology Rationales

Item#	Rationale	
1	Option B is correct	The nerves in the integumentary system (skin) sense the irritation and send the signal to the brain. The brain then sends impulses through the nervous system to scratch the itch.
	Option A is incorrect	The circulatory system is responsible for transporting materials throughout the body. The excretory system is responsible for removing waste from the body.
	Option C is incorrect	The digestive system is responsible for breaking food down into nutrients that can be absorbed by the body. The muscular system is used for movement, posture, and circulation of blood throughout the body.
	Option D is incorrect	The respiratory system is responsible for the exchange of oxygen and carbon dioxide in the body. The lymphatic system is responsible for transporting lymph, a fluid containing infection-fighting white blood cells, throughout the body.

Item#	Rationale	
2	Option F is correct	Cyclins control the progression through the cell cycle. If cyclins do not degrade, then cells will continue to go through the cell cycle, resulting in the formation of a tumor (uncontrolled cell growth).
	Option G is incorrect	Uncontrolled production of cyclins does not result in immediate death of the cell.
	Option H is incorrect	Uncontrolled production of cyclins would result in a tumor (uncontrolled cell growth) and not be transferred to other cells.
	Option J is incorrect	The formation of haploid cells is a result of a cell going through meiosis, not the cell cycle.

Item#	Rationale	
3	Option C is correct	This type of mutation is a substitution because the T nucleotide in the GTA DNA triplet was replaced with a G nucleotide in the mutated DNA triplet.
	Option A is incorrect	Insertion mutations occur when a nucleotide or sequence of nucleotides is inserted into the existing DNA without replacing any of the existing nucleotides.
	Option B is incorrect	Translocation mutations occur when a segment of a chromosome changes positions with a segment of another chromosome.
	Option D is incorrect	Deletion mutations occur when a nucleotide or sequence of nucleotides are deleted from the existing DNA.

Item#	Rationale	
4	Option J is correct	The resistant individuals that survive the spraying of pesticide are able to reproduce. This resistance is likely due to a genetic variation that has been inherited from their parents. As the pesticide-resistant insects reproduce, the genetic variant that makes them resistant to the pesticide will become more prevalent in the population.
	Option F is incorrect	The resistant insects were not able to transform the pesticide into a safe form. They were able to survive and reproduce, producing resistant offspring.
	Option G is incorrect	The resistant insects may have been able to grow larger; however, this would not have resulted in the pesticide becoming ineffective. The resistant individuals were able to survive and reproduce, producing resistant offspring.
	Option H is incorrect	The resistant insects may be able to eat the contaminated food; however, it is their ability to survive and reproduce that would make the pesticide ineffective.

Item#	Rationale	
5	Option B is correct	The main function of the wings of the Gentoo penguin and the legs of the common ostrich is for locomotion, which allows the birds to escape from predators.
	Option A is incorrect	The ability to find prey is related to sensory organs and not locomotive organs.
	Option C is incorrect	The ability to control body temperature is related to the circulatory system and the feathers in the integumentary system and not related to locomotive structures.
	Option D is incorrect	The ability to be camouflaged within their environments is related to the coloration of their feathers and not to locomotive structures.

Item#	Rationale	
6	Option F is correct	All living things are made of cells, which contain DNA made of the nucleotides adenine, thymine, guanine, and cytosine.
	Option G is incorrect	Only plant cells are surrounded by a cell wall made of cellulose.
	Option H is incorrect	Prokaryotic cells do not have a membrane-bound nucleus.
	Option J is incorrect	Prokaryotic cells do not have mitochondria.

Item#	Rationale	
7	Option D is correct	Using the general 10% law, which states 90% of the energy is lost at each trophic level (grass being at 100%), the hognose snakes would receive 0.1% of the energy produced by the grass, and at most, the owl could receive 1% of the energy produced by the grass.
	Option A is incorrect	The cricket could receive 10% of the energy produced by the grass, and the sparrows could receive 1% of the energy produced by the grass.
	Option B is incorrect	The toads could receive 1% of the energy produced by the grass, and the spiders could receive 1% of the energy produced by the grass.
	Option C is incorrect	The rabbits could receive 10% of the energy produced by the grass, and the owls could receive 1% of the energy produced by the grass.

Item#	Rationale	
8	Option G is correct	The process of the cell cycle is how living organisms produce more cells, which allow the organisms to grow, develop, and reproduce.
	Option F is incorrect	A life cycle that contains fertilized eggs is an example of sexual reproduction, and does not produce clones.
	Option H is incorrect	Most frog offspring are produced by fertilization of gametes, which are produced through meiosis, not the cell cycle.
	Option J is incorrect	Natural selection of certain traits in the frog allows for the frogs that are best adapted to survive and reproduce.

Item#	Rationale	
9	Option B is correct	Light energy is captured by the pigments in leaves during photosynthesis. The light energy is converted into chemical energy in the bonds of glucose, which is made during photosynthesis. Glucose is then used during cellular respiration to make another kind of chemical energy, ATP.
	Option A is incorrect	Chemical energy stored in the bonds of glucose is used during cellular respiration, and heat is released; however, this heat is not used by producers during photosynthesis to make light energy.
	Option C is incorrect	Thermal energy is not produced during photosynthesis or used during cellular respiration.
	Option D is incorrect	Cellular respiration does not use light energy to make chemical energy for photosynthesis.

Item#	Rationale	
10	Option G is correct	Overfishing decreases the stability of the ecosystem by disrupting the food chains of other organisms within the ecosystem. This causes an imbalance in predator-prey relationships, resulting in either a decrease in certain organisms or an increase in others.
	Option F is incorrect	Increasing competition for resources would result in a decrease in ecosystem stability.
	Option H is incorrect	Overfishing affects multiple species in the ecosystem, not just one.
	Option J is incorrect	Overpopulation results in a decrease of ecosystem stability because it increases competition for resources.

Item#	Rationale	
11	Option C is correct	Hydrogen bonds connect the nitrogenous bases of the DNA strands.
	Option A is incorrect	Nucleotides are what are connected by the labeled hydrogen bonds in the DNA segment.
	Option B is incorrect	Phosphate groups are a part of the backbone of the DNA segment. The backbone is the part of the DNA segment that the nucleotides are attached to.
	Option D is incorrect	Deoxyribose is a part of the backbone of the DNA segment. The backbone is the part of the DNA segment that the nucleotides are attached to.

Item#	Rationale	
12	Option G is correct	ATP is the chemical energy that is used to power all cellular processes, including chemical reactions. DNA is the molecule that carries and transmits the genetic information of organisms.
	Option F is incorrect	DNA is the molecule that carries and transmits the genetic information of organisms. Enzymes are the molecules that serve as biological catalysts that speed up the rate of chemical reactions.
	Option H is incorrect	Enzymes are the molecules that serve as biological catalysts that speed up the rate of chemical reactions. Cellulose is the type of sugar that is used for structural support in the cell walls of plants.
	Option J is incorrect	Cellulose is the type of sugar that is used for structural support in the cell walls of plants. ATP is the chemical energy that is used to power all cellular processes, including chemical reactions.

Item#	Rationale	
13	Option A is correct	The vertebral column is the trait that is at the root of the cladogram. The root of the cladogram represents the initial ancestor/trait that is common to all the organisms within the cladogram.
	Option B is incorrect	The trait for hair is common to the horse, wolf, tiger, and house cat, but not the turtle.
	Option C is incorrect	The traits for sharp teeth and retractable claws are common to the tiger and house cat, but not the turtle, horse, or wolf.
	Option D is incorrect	The ability to purr is only found in the house cat and not in the turtle, horse, wolf, or tiger.

Item#	Rationale	
14	Option F is correct	Eukaryotic cells have DNA chromosomes contained in a membrane-bound nucleus. Prokaryotic cells have DNA chromosomes in the cytoplasm and do not have a nucleus or other membrane-bound organelles.
	Option G is incorrect	Eukaryotic cells have DNA chromosomes contained in a membrane-bound nucleus, not free-floating within the cytoplasm.
	Option H is incorrect	Eukaryotic cells have DNA chromosomes contained in a membrane-bound nucleus. Prokaryotic cells have DNA chromosomes in the cytoplasm and do not have a nucleus or other membrane-bound organelles.
	Option J is incorrect	Eukaryotic cells have membrane-bound organelles. Prokaryotic cells have DNA chromosomes in the cytoplasm and do not have a nucleus or other membrane-bound organelles.

Item#	Rationale	
15	Option C is correct	The Mexican long-nosed bats have traits that are more favorable over other bats and that help them to be successful in their environment.
	Option A is incorrect	An increase in predation by other species is not a trait or behavior that would allow the bat to survive and reproduce.
	Option B is incorrect	Mutations that do not increase survival or reproductive success are not considered adaptations.
	Option D is incorrect	Intentional breeding is an example of artificial selection. In artificial selection, organisms are intentionally mated to produce offspring with a desired outcome or trait.

Item#	Rationale	
16	Option G is correct	Osmosis is the diffusion of water molecules across the plasma membrane from a less concentrated solution into a more concentrated solution without the use of active transport and energy from ATP. As the water molecules move, the concentrations on each side of the membrane become more equal.
	Option F is incorrect	Osmosis is a form of passive transport and would not require energy from sugar molecules, nor is it dependent on the cell's ability to divide.
	Option H is incorrect	While ions can be transported by both active or passive transport across the plasma membrane, osmosis only describes the movement of water into and out of the cell.
	Option J is incorrect	Enzymes would move across the plasma membrane with the use of a protein channel and would not be able to diffuse through the plasma membrane.

Item#	Rationale	
17	Option D is correct	As more varieties of plants are able to grow on the sand dunes, a wider variety of animals and insects will also be able to survive on the sand dunes. This increase in different plant and animal species leads to an increase in species diversity.
	Option A is incorrect	As more plants are able to grow on the sand dunes, the number of beneficial bacteria will also increase.
	Option B is incorrect	As more plants are able to grow on the sand dunes, more consumers will be able to feed on and acquire energy from the plants.
	Option C is incorrect	As more plants are able to grow on the sand dunes, the root systems will be able to hold the sand stable and reduce the amount of erosion occurring.

Item#	Rationale	
18	Option G is correct	Organisms in Kingdom Protista are eukaryotic, unicellular, and can be either autotrophic or heterotrophic.
	Option F is incorrect	Organisms in Kingdom Bacteria are not eukaryotic.
	Option H is incorrect	Organisms in Kingdom Archaea are not eukaryotic.
	Option J is incorrect	Organisms in Kingdom Animalia are not unicellular.

Item#	Rationale	
19	Option C is correct	Enzymes are specific to certain substrates. The shape of the enzyme and shape of the substrate fit together at the active site, similar to puzzle pieces.
	Option A is incorrect	If the active site of an enzyme is occupied by an inhibitor, then the substrate will not be able to attach to the enzyme at the active site.
	Option B is incorrect	The function of enzymes is to lower the activation energy level of a chemical reaction.
	Option D is incorrect	Enzymes are not typically destroyed during reactions and can be used over and over again.

Item#	Rationale	
20	Option G is correct	The genes that control the snowshoe hare's coat color are turned on and off based on the amount of daylight, thus changing the color of the hare's coat during different seasons.
	Option F is incorrect	Mutations are not reversible. If a mutation occurred to change the snowshoe hare's coat color, it would not be able to change back to its original form during the lifetime of the hare.
	Option H is incorrect	While sunlight may cause cancer cells to develop, it is not the underlying mechanism that causes the seasonal changes in the coat color in snowshoe hares.
	Option J is incorrect	Genes are not removed from genomes during a lifetime or a season. All genes are present in all cells and can be signaled to be on or off depending on different external factors.

Item#	Rationale	
21	Option C is correct	Parasites require a host organism in order to survive. They typically steal nutrients or resources from the host, resulting in decreased/slowed growth of the host. This graph shows that Plant 1, the host, grows better once Plant 2, the parasite, has been removed and Plant 2, the parasite, has decreased growth.
	Option A is incorrect	This graph does not represent a parasitic relationship because Plant 2, the parasite, continues to increase in growth after it has been removed from Plant 1, the host.
	Option B is incorrect	This graph does not represent a parasitic relationship because both Plant 1 and Plant 2 have decreased growth after Plant 2 has been removed.
	Option D is incorrect	This graph does not represent a parasitic relationship because both Plant 1 and Plant 2 continue to grow well after they have been separated.

Item#	Rationale	
22	Option G is correct	Transitional fossils are the remains of organisms that are older versions of a species and its more recent ancestors. Transitional fossils would show evidence of gradualism, a form of evolution where a species evolves continually over long periods of time.
	Option F is incorrect	Transitional fossils would not show the seasonal change in the diet of a species.
	Option H is incorrect	While DNA may be able to be found in transitional fossils, the majority of all living organisms use DNA as genetic material.
	Option J is incorrect	Transitional fossils across many rock layers provide evidence of a slowly changing environment.

Item#	Rationale	
23	Option D is correct	Environmental factors such as chemicals, temperature, and light can determine which genes are turned on and off, thereby influencing the way an organism develops and functions.
	Option A is incorrect	Mitosis is not the mechanism by which genes are activated as a result of environmental factors.
	Option B is incorrect	Genes are not activated during the stage of meiosis when homologous chromosome pairs are separated to create haploid gametes because the chromosomes are condensed.
	Option C is incorrect	The size of the genome of an organism stays the same throughout its life.

Item#	Rationale	
24	Option H is correct	In order to self-pollinate, a pollen grain from a flower would need to be transferred from the anther of that flower to the stigma of the same flower.
	Option F is incorrect	Anthers cannot be transferred from flower to flower. Pollen grains are what need to be transferred in order to pollinate a flower.
	Option G is incorrect	Ovules cannot be transferred from flower to flower. Pollen grains are what need to be transferred in order to pollinate a flower.
	Option J is incorrect	Ovaries cannot be transferred from flower to flower. Pollen grains are what need to be transferred in order to pollinate a flower.

Item#	Rationale	
25	Option B is correct	Aagg is not a possible outcome from this cross because there is only one g allele present in the parent generation.
	Option A is incorrect	The only possible outcomes for this genetic cross are: AaGG, AaGg, aaGG, and aaGg.
	Option C is incorrect	The only possible outcomes for this genetic cross are: AaGG, AaGg, aaGG, and aaGg.
	Option D is incorrect	The only possible outcomes for this genetic cross are: AaGG, AaGg, aaGG, and aaGg.

Item#	Rationale	
26	Option J is correct	The function of these three systems interacting begins when the salivary enzymes in the digestive system break down food into nutrients. A hormone signal triggers the endocrine system to absorb these nutrients into the bloodstream, which is part of the circulatory system.
	Option F is incorrect	The function of the integumentary system is to act as a barrier to protect the body from the outside world. The function of the muscular system is movement. These two body systems are not interacting to cause the listed processes to occur.
	Option G is incorrect	The function of the excretory system is to remove waste from the body. The function of the immune system is to protect the body from foreign pathogens such as microbes or chemicals. The function of the muscular system is movement. These three body systems are not interacting to cause the listed processes to occur.
	Option H is incorrect	The function of the excretory system is to remove waste from the body. The function of the immune system is to protect the body from foreign pathogens such as microbes or chemicals. These two body systems are not interacting to cause the listed processes to occur.

Item#	Rationale	
27	Option A is correct	The DNA sequence of a gene is used to make an mRNA copy. The mRNA copy is then translated into a sequence of amino acids. This DNA sequence codes the sequence of amino acids as shown: DNA: 3′ TCA TGC ATG 5′ mRNA: 5′ AGU ACG UAC 3′ Amino acid sequence: Serine - Threonine - Tyrosine
	Option B is incorrect	The DNA triplet TGC would not be translated into the amino acid serine.
	Option C is incorrect	The DNA triplet ATG would not be translated into the amino acid methionine.
	Option D is incorrect	The DNA triplets TGC and ATG would not be translated into the amino acids alanine and methionine.

Item#	Rationale	
28	Option H is correct	Many insects are beneficial to farmers for pollination. This introduced bird may also feed on the beneficial insects as well as the pest insects and reduce the pollination of the crop.
	Option F is incorrect	Increasing the biodiversity of the native plant species would be a beneficial impact.
	Option G is incorrect	Typically, birds that feed on insects are not pollinators.
	Option J is incorrect	Different species of birds will not be able to mate successfully.

Item#	Rationale	
29	Option D is correct	Large, round ears are keyed from 5a. Step 5 is keyed by 3b (less than 35 cm wingspan). Step 3 is keyed by 1b (colonial bat). Together, these indicate that the Mexican free-tailed bat has large, round ears, a less than 35 cm wingspan, and is colonial.
	Option A is incorrect	A solitary bat with a wingspan greater than 35 cm is the Hoary bat.
	Option B is incorrect	A solitary bat with a wingspan less than 35 cm would be either the Seminole bat or the Eastern red bat.
	Option C is incorrect	A colonial bat with a wingspan greater than 35 cm would be the Big brown bat.

Item#	Rationale	
30	Option H is correct	Blue yarn represents genetic material. All prokaryotic cells, eukaryotic cells, and viruses have genetic material.
	Option F is incorrect	Yellow paper ovals represent cytoplasm. Viruses do not contain cytoplasm.
	Option G is incorrect	Gray paper hexagon represents a capsid. Capsids are only present in viruses.
	Option J is incorrect	Orange paper circles represent a nucleus. Prokaryotic cells and viruses do not have a nucleus.

Item#	Rationale	
31	Option C is correct	Both carbohydrates and lipids are used to store energy.
	Option A is incorrect	Although some hormones are derived from lipids, carbohydrates do not produce hormones.
	Option B is incorrect	Cellulose is a type of carbohydrate used as the structural support of cell walls. Lipids are not used as the structural support of cell walls.
	Option D is incorrect	Enzymes, a type of protein, are used as catalysts for chemical reactions.

Item#	Rationale	
32	Option G is correct	Producers use carbon dioxide during photosynthesis and convert it into glucose. Consumers then ingest the carbon in the glucose and use that glucose during cellular respiration, releasing carbon dioxide as they exhale.
	Option F is incorrect	Consumers release carbon dioxide when they exhale, and producers take it in during photosynthesis.
	Option H is incorrect	Producers take in carbon dioxide from the atmosphere.
	Option J is incorrect	Consumers take in carbon by ingesting producers or other consumers that contain carbon.

Item#	Rationale	
33	Option A is correct	The plasma membrane contributes to cellular homeostasis by controlling what can enter and exit the cell.
	Option B is incorrect	The plasma membrane does not catalyze the production of proteins.
	Option C is incorrect	The plasma membrane does not convert ATP to glucose.
	Option D is incorrect	The plasma membrane does not catalyze the production of proteins.

Item#	Rationale	
34	Option F is correct	The sequence of the nucleotides determines what traits will be expressed, such as coat color in cattle.
	Option G is incorrect	The number of chromosomes in the somatic cells responsible for coat color in Texas Longhorn cattle is normally the same.
	Option H is incorrect	Diet can have an effect on the coat color of cattle; however, it is not the genetic basis of the coat color.
	Option J is incorrect	Environmental conditions can have an effect on the coat color of cattle; however, it is not the genetic basis of the coat color.

Item#	Rationale	
35	Option D is correct	The Northern leopard frog and the bullfrog are the most closely related of these species because they share the same Genus.
	Option A is incorrect	The Northern cricket frog and the bullfrog share the same Order, which is a more general classification than Family or Genus.
	Option B is incorrect	The Northern leopard frog and the green treefrog share the same Order, which is a more general classification than Family or Genus.
	Option C is incorrect	The Northern cricket frog and the green treefrog share the same Family, which is a more general classification than Genus.

Item#	Rationale	
36	Option G is correct	Organs work together to make up an organ system. Organ systems work together to make up an organism. A group of organisms of the same species makes up a population. A group of populations in the same area make up a community.
	Option F is incorrect	Cells are the basic unit of life. A group of cells working together makes up tissues. A group of tissues working together make up an organ.
	Option H is incorrect	A group of communities in a certain area as well as all of the nonliving components of that area, such as water, rocks, and dirt, make up an ecosystem.
	Option J is incorrect	A biosphere consists of all the ecosystems on Earth.

Item#	Rationale	
37	Option D is correct	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.
	Option A is incorrect	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.
	Option B is incorrect	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.
	Option C is incorrect	Somatic mutations occur in body cells and not within the eggs or sperm, so they are not heritable by offspring.

Item#	Rationale	
38	Option G is correct	The hyenas and gray wolves have a mutualistic relationship because both organisms benefit from each other. The hyenas have access to food sources the gray wolves hunt, and the gray wolves have access to bone marrow after the hyenas have cracked open the large bones of the prey. The gray wolves and goats have a predator-prey relationship because the gray wolves hunt and feed on the goats.
	Option F is incorrect	Hyenas are not a predator or prey of gray wolves. Gray wolves and goats do not have a commensalistic relationship because the goats are harmed.
	Option H is incorrect	Hyenas and gray wolves do not exhibit a parasitic relationship because neither the hyenas nor the gray wolves require the other to survive. Gray wolves and goats do not exhibit a mutualistic relationship because the goats are harmed.
	Option J is incorrect	Hyenas and gray wolves do not exhibit a commensalistic relationship because both benefit from the relationship. Gray wolves and goats do not exhibit a parasitic relationship because neither require the other to live and survive.

Item#	Rationale	
39	Option A is correct	During interphase, the cell is growing in size (G_1), replicating its DNA (S phase), and duplicating its cell structures (G_2) to prepare for cellular division.
	Option B is incorrect	The cessation of cellular processes and the activity of lysosomes are not responsible for the length of time cells spend in interphase.
	Option C is incorrect	The synthesis of spindle fibers takes place in M phase, not interphase.
	Option D is incorrect	Cytokinesis, division of the cytoplasm, is completed directly after mitosis (M phase) and is not part of interphase.

Item#	Rationale	
40	Option H is correct	Many organisms do not provide care or protection for their offspring. Laying a large quantity of eggs helps to ensure that some individuals will survive to adulthood and reproduce.
	Option F is incorrect	The number of eggs laid will not impact the average body size of individuals that survive.
	Option G is incorrect	If all hatchlings were to survive, laying a large quantity of eggs would increase competition among the octopus species.
	Option J is incorrect	The quantity of hatchlings does not impact the likelihood that a single hatchling will be consumed.

Item#	Rationale	
41	Option A is correct	A black angelfish has a genotype of BB. A black-lace angelfish has a genotype of BL. A cross between BB × BL results in a probability of 50% of the offspring having the genotype BB and phenotype of black and 50% of the offspring having the genotype BL and phenotype of black lace.
	Option B is incorrect	The genetic cross that would result in 50% silver (LL) and 50% black (BB) would be a silver (LL) crossed with a black lace (BL).
	Option C is incorrect	The genetic cross that would result in 25% silver (LL), 25% black (BB), and 50% black lace (BL) would be a black lace (BL) crossed with another black lace (BL).
	Option D is incorrect	There is no genetic cross from these genotypes that would result in 25% silver (LL), 50% black (BB), and 25% black lace (BL).

Item#	Rationale	
42	Option H is correct	The loggerhead sea turtle occupies the primary consumer level by feeding on the clover grass and the secondary consumer level by feeding on the gulf pipefish.
	Option F is incorrect	The Canada goose occupies only the primary consumer level in this food web by feeding on only the producer, the clover grass.
	Option G is incorrect	The Eastern cottontail occupies only the primary consumer level in this food web by feeding on only the producer, the clover grass.
	Option J is incorrect	The sand dollar occupies only the primary consumer level in this food web by feeding on only producers, clover grass and phytoplankton.

Item#	Rationale	
43	Option B is correct	The virus must enter the host cell in order to use the cell's machinery to make new viral particles.
	Option A is incorrect	The virus must enter the host cell in order to produce new viruses.
	Option C is incorrect	Viruses must use a cell's machinery to make new viruses. Gametes, egg and sperm, are made through meiosis.
	Option D is incorrect	Carbon dioxide is not needed by the virus or the host cell in order to make a new virus.

Item#	Rationale	
44	Option H is correct	Each node on the cladogram represents a speciation event. *Haplonycteris* fischeri and *Ptenochirus jagori* are the least related because they are separated by six nodes, or where a speciation event took place.
	Option F is incorrect	*Ptenochirus minor* and *Megaerops niphanae* are separated by only two nodes.
	Option G is incorrect	*Dyacopterus spadiceus* and *Otopteropus cartilagonodus* are separated by only three nodes.
	Option J is incorrect	*Cynopterus sphinx* and *Chironax melanocephalus* are separated by only three nodes.

Item#	Rationale	
45	Option D is correct	Bacteria break down the organic matter in dead and decaying organisms and return that material to the soil. The organic matter can then be used by plants for growth.
	Option A is incorrect	Plants are producers. Plants are able to grow due to the organic material that is added to the soil from decomposers.
	Option B is incorrect	The production of toxins does not describe how bacteria recycle matter in the ecosystem.
	Option C is incorrect	The ability of bacteria to cause disease does not describe how bacteria recycle matter in an ecosystem.

Item#	Rationale	
46	Option F is correct	The hormone auxin responds to light stimulus and promotes cell elongation on the side of the stem that is not exposed to light. This causes the stem to bend toward the direction of the light.
	Option G is incorrect	Sugars are produced during the process of photosynthesis, and not in response to gravity.
	Option H is incorrect	The production of carbon dioxide does not cause plant shoots to bend toward the light, the hormone auxin does.
	Option J is incorrect	Water production during respiration does not cause the bending of shoots toward the light. Water is lost to the air through the process of transpiration, which occurs in the leaves.

Item#	Rationale	
47	Option C is correct	During the lytic cycle, the virus enters the host cell and uses its machinery to produce new viruses. The cell then ruptures, releasing and spreading the virus in the body.
	Option A is incorrect	Viruses that reproduce via the lytic and lysogenic cycles can both be transmitted by mosquitoes.
	Option B is incorrect	Vaccinations work to prevent the reproduction of viruses.
	Option D is incorrect	The symptom of a fever would indicate the virus is actively reproducing new virus particles, which would indicate that the virus is in the lytic cycle rather than the lysogenic cycle.

Item#	Rationale	
48	Option J is correct	The process represented is crossing-over. During crossing-over, bits of one chromosome cross over another chromosome and that genetic information is exchanged, creating a new genetic variant.
	Option F is incorrect	The process of crossing-over depicted here does not directly contribute to an organism's ability to grow and heal itself.
	Option G is incorrect	The process of crossing-over prevents the production of clones since it is creating new genetic variants.
	Option H is incorrect	The process of crossing-over occurs after the DNA in the homologous chromosome pairs have already been copied.

Item#	Rationale	
49	Option C is correct	The diaphragm is a muscle located under the ribs. When the diaphragm contracts, it moves downward, increasing the space within the chest and allowing the lungs to expand and bring in air. When the diaphragm relaxes, it moves upward, decreasing the space within the chest and expelling the air from the lungs.
	Option A is incorrect	Hormones are produced by the endocrine system.
	Option B is incorrect	Urine is eliminated by the excretory system.
	Option D is incorrect	Nutrients are absorbed in the digestive system.

Item#	Rationale	
50	Option J is correct	The scientific names of organisms are assigned a genus and species and are individual. Different species will not have the same scientific name. The species part of the name is the most specific and will ensure the scientists are studying the same type of firefly.
	Option F is incorrect	The size of the population can be determined by many factors and will not ensure the scientists are studying the same type of firefly.
	Option G is incorrect	Fireflies can live in many different habitats. Studying the habitats of the fireflies will not ensure the scientists are studying the same type of firefly.
	Option H is incorrect	All types of fireflies can emit light. Studying the color of light produced may help the scientists study similar fireflies, but it will not ensure they are studying the same type of firefly.