

Biology EOC Practice Assessment 2014-15

1



A judge allowed a DNA analysis to be entered as evidence in court.

Which of the following statements *best* explains why the use of DNA analysis is so effective in establishing identity?

- (A) The procedure for DNA fingerprinting is an accurate series of simple techniques.
- (B) The probability of two people having similar DNA fingerprints is small.
- (C) The purpose of DNA fingerprinting is to match sections of base pairs.
- (D) The percentage of identical DNA within a species is high.

2



A researcher wants to measure the rate of photosynthesis in two different types of water plants growing in two different aquariums under the same conditions.

Which measurement would give the *most* information about the rate of photosynthesis?

- (A) The intensity of light available to each aquarium
- (B) The temperature of water in each aquarium
- (C) The level of dissolved nitrogen in each aquarium
- (D) The amount of oxygen produced in each aquarium

3



The table below shows the classifications of four animals.

According to their classification, which of the following animals are *most* closely related?

Animal Classification

Animal	Q	R	S	T
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia
Order	Carnivora	Rodentia	Rodentia	Carnivora
Family	Canidae	Muridae	Muridae	Felidae
Genus and species	<i>Canis familiaris</i>	<i>Mus musculus</i>	<i>Mesocricetus auratus</i>	<i>Felis sylvestris</i>

- (A) Q and R
- (B) S and T
- (C) Q and T
- (D) R and S

4



In pea plants, the allele for red flowers (R) is dominant, and the allele for white flowers (r) is recessive. The Punnett square below shows the cross of two pea plants, each with red flowers.

According to the Punnett square, what percent of the offspring resulting from this cross will have red flowers?

	R	r
R		
r		

- (A) 25%
- (B) 50%
- (C) 75%
- (D) 100%

5

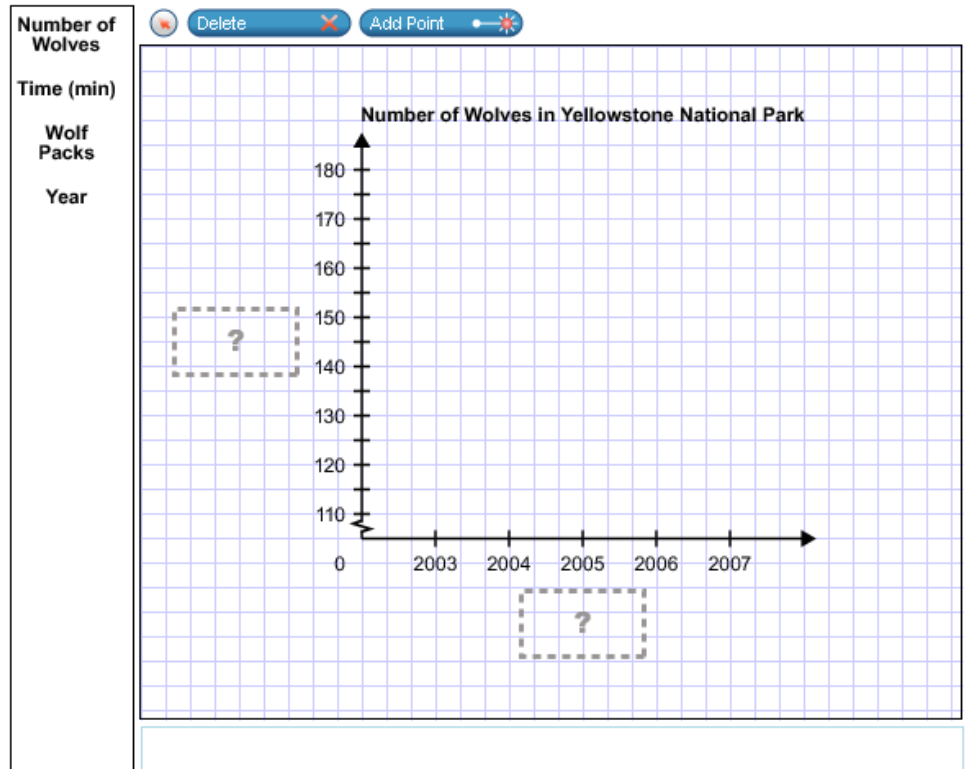


A scientist studying wolves in Yellowstone National Park collects the following data about their population.

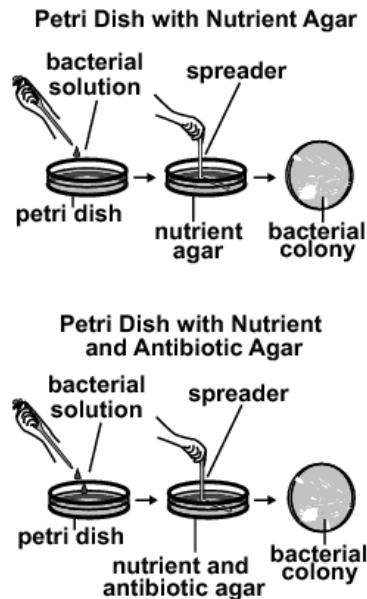
Number of Wolves in Yellowstone National Park

Year	Number of Wolves
2003	175
2004	170
2005	120
2006	135
2007	170

- A. Use the "Add Point" tool to plot 5 points on the graph for the data shown in the table.
- B. Place two labels in the blank boxes for the graph axes.
 - You should only use two of the labels shown.
 - Be sure to label both axes.



A student tests the effects of antibiotics on bacteria. She uses two petri dishes that contain a solid agar on the bottom. Both dishes have nutrients in the agar, but the second dish also has an antibiotic in the agar. She puts 0.1 mL of a bacterial solution into one petri dish and 0.2 mL of the same bacterial solution into the second petri dish. She spreads out each solution over the agar. She allows the bacteria to grow overnight. The pictures below show the student's experimental setup.



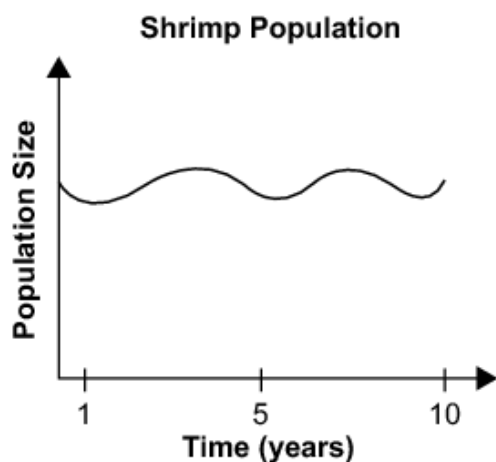
The next day, the student counts the number of colonies in each dish. Each colony appears as a spot in the dish and contains millions of cells that grew from a single bacterium. The dish without antibiotics has 190 colonies, and the dish with antibiotics has 200 colonies. She concludes that antibiotics have little effect on bacteria.

Which statement describes what the student could do to improve her experimental procedure?

- (A) Add more of the antibiotic to the agar in the second dish.
- (B) Let the bacteria grow in the dishes for another day.
- (C) Place the dish without the antibiotic in the refrigerator.
- (D) Put the same amount of bacterial solution into each petri dish.

The graph shows changes in a population of shrimp over time.

Which conclusion is supported by this data?



- (A) An invasive species lives in this ecosystem.
- (B) Shrimp have a symbiotic relationship with another organism.
- (C) The food source for this population changes seasonally.
- (D) This population of organisms lives in a stable environment.

Carbohydrates are macromolecules used for energy in living organisms. Large carbohydrate molecules are made of smaller building blocks called monosaccharides.

The arrangement of which three components is used to distinguish one monosaccharide from another?

- (A) Carbon, hydrogen, and oxygen
- (B) Glucose, fructose, and ribose
- (C) Peptide, fatty acid, and purine
- (D) Water, carbon dioxide, and nitrogen

		Second Position				
		U	C	A	G	
First Position (5' end)	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr Stop Stop	Cys Cys Stop Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G
						Third Position (3' end)

9

≡

The table shows which mRNA codons code for various amino acids.

Which amino acid sequence will be produced by translation of the mRNA sequence UAC UCU ACC?

- (A) Asn – Pro – Thr
- (B) Thr – Pro – Asn
- (C) Thr – Ser – Tyr
- (D) Tyr – Ser – Thr

10

The diagram shows a model of a cell. For proper cell function, sodium (Na^+) and potassium (K^+) ions must be actively transported into and out of the cell. The arrows in the protein pump show the direction of the net flow of each ion.

- A. Place Na^+ labels inside and outside the cell to illustrate the correct concentration gradient for active transport to occur.
- B. Place K^+ labels inside and outside the cell to illustrate the correct concentration gradient for active transport to occur.
- C. Place the energy molecule that is required for active transport on top of the protein pump structure.

- You should use more than one Na^+ label.
- You should use more than one K^+ label.
- Only **one** energy molecule is needed.

K⁺

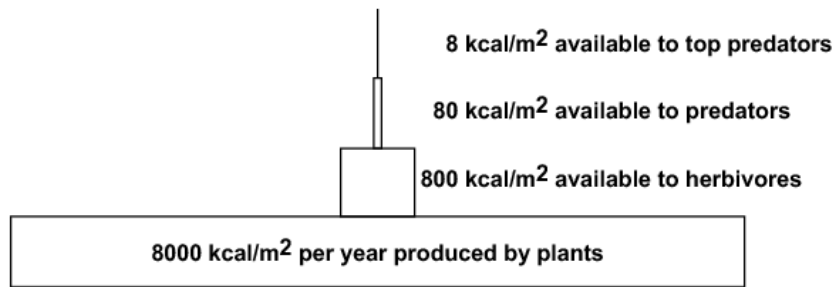
Na⁺

ATP

NADH

Delete

The diagram below is an energy pyramid showing the amount of energy available at each trophic level. Each level receives approximately 10% of the energy from the level below.



Which of the following statements *best* explains the difference in the amount of energy available at each trophic level?

- Ⓐ Higher trophic levels contain 90% more organisms than lower levels.
- Ⓑ Producers pass 90% of the energy from sunlight to the next level.
- Ⓒ Life functions at each trophic level consume 90% of the remaining energy.
- Ⓓ Organisms in lower trophic levels digest food 90% faster than those in the middle levels.

When a cyclist rides up a steep hill, the cyclist's circulation and breathing rate increase, allowing a greater amount of oxygen to reach the cyclist's muscles. In order to generate energy from this extra oxygen, skeletal muscle must contain a greater number of a certain cell part than other tissues.

Which of the following cell parts is *more* numerous in skeletal muscle than in other tissues?

- Ⓐ Golgi bodies
- Ⓑ Lysosomes
- Ⓒ Ribosomes
- Ⓓ Mitochondria

A student uses a microscope to observe cells in the root tissue of an onion. He concludes that the cells are reproducing by mitosis.

Which hypothesis is supported by his conclusion?

- Ⓐ The root tissue cells all have the same set of chromosomes.
- Ⓑ The root tissue cells each have a unique genetic make-up.
- Ⓒ The root tissue cells produce identical gametes.
- Ⓓ The root tissue cells split to form stem cells.

C. reinhardtii is a species of unicellular green algae that primarily produce energy for growth through photosynthesis. However, when necessary, they can also produce energy from a carbon source, which allows them to grow in total darkness. A scientist grows a population of this algae in the dark and finds that after 600 generations, the algae population now grows better in the dark than in the light.

Which statement *best* explains what has happened to the cells in the algae population?

- (A) The cells that were better adapted to growing in the dark reproduced more.
- (B) The cells that were better adapted to growing in the light got smaller in size.
- (C) They became contaminated with a species of algae that grow only in the dark.
- (D) They evolved into a different species that can grow only in the dark.

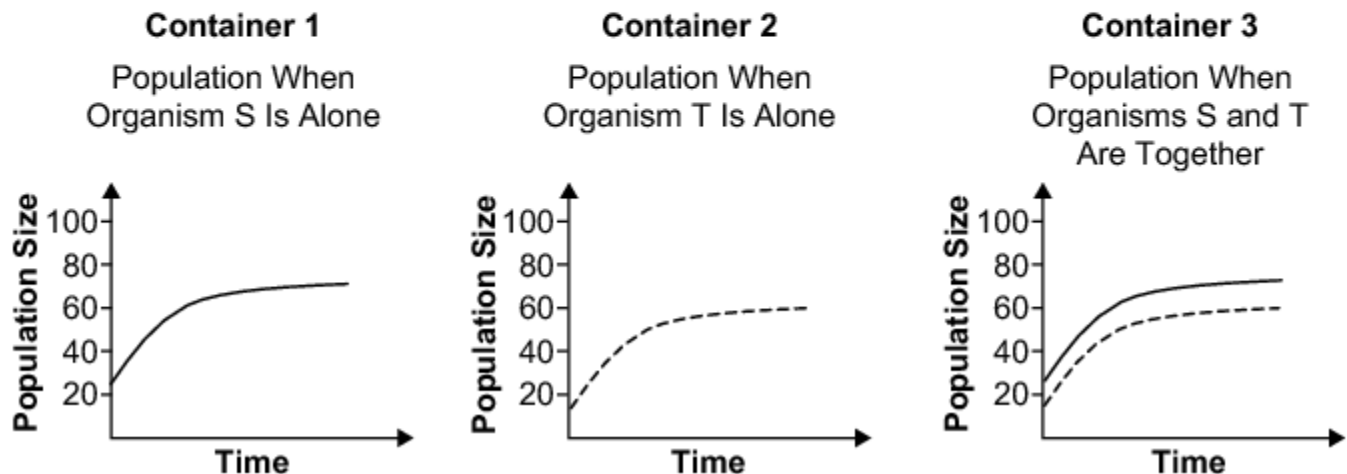
The cytoplasm of muscle cells experiences an increase in CO₂ levels and a decrease in pH during heavy aerobic exercise.

The processes of which cell organelle are responsible for these changes?

- (A) Endoplasmic reticulum
- (B) Golgi apparatus
- (C) Mitochondrion
- (D) Nucleus

A scientist investigates the interaction of single-cell pond organisms S and T. He places organism S in pond water in Container 1. He places organism T in pond water in Container 2. He places both organisms in pond water in Container 3. The graphs show how the populations of the organisms in the containers change over time.

What can the scientist conclude from this data about the interaction of organisms S and T?



Key	
Organism S	_____
Organism T	-----

- Ⓐ Organisms S and T are neither benefited nor harmed by living together.
- Ⓑ Organisms S and T both benefit from living together.
- Ⓒ Organism S benefits from living with organism T and organism T is harmed.
- Ⓓ Organism S benefits from living with organism T and organism T is unaffected.

17



A scientist crosses a homozygous red-eyed fruit fly with a homozygous white-eyed fruit fly. He returns to the lab several days later to record the phenotypes of the offspring in the F1 generation. While collecting his data, the scientist realizes that individuals in the F1 generation have produced an F2 generation of offspring in the same test tube.

Which statement explains what the scientist should do next in his experiment?

- Ⓐ Find similar fruit fly studies and use the data from those investigations.
- Ⓑ Finish collecting his data on all of the offspring and record it as the F1 generation.
- Ⓒ Record half of the individuals as the F1 generation and the other half as the F2 generation.
- Ⓓ Repeat the initial cross using a new pair of homozygous individuals.

18



A substitution of thymine with adenine in one DNA codon causes a particular disorder.

Which statement explains how the change in DNA leads to this disorder?

- Ⓐ The deletion mutation prevents the production of the hemoglobin protein in the body.
- Ⓑ The frameshift mutation prevents the production of several proteins found in the blood.
- Ⓒ The insertion mutation causes extra hemoglobin proteins to attach to red blood cells.
- Ⓓ The point mutation causes a different amino acid to be added to the hemoglobin protein.

A student is investigating the effect of temperature on the growth rate of two variations of a plant species. One variation of the plant has broad leaves and the other has narrow leaves. The student prepares to grow several plants of each variation at four different temperatures. She then creates the data table shown to record the height of each plant at the end of the experiment.

How can the student *best* improve the validity of the experiment?

Plant Growth Rate Experiment

Temperature (°C)	Final Plant Height (cm)	
	Broad Leaf Variation	Narrow Leaf Variation
15		
21		
26		
32		

- (A) Complete the experiment outside to better control the growing conditions.
- (B) Grow only one variation of the plant species to simplify the data analysis.
- (C) Record the heights of the plants daily throughout the length of the experiment.
- (D) Reduce data collection by focusing on one temperature instead of several.

Marine Organism Observations

Organism	Behavior	Movement
T	Feeds on Organism U	Mobile
U	Feeds on Organism V and W	Mobile
V	Is eaten by Organism U	Mobile
W	Is eaten by Organisms U and V	Stationary

A student examines the information in the table. The student concludes that Organism W should be placed at the base of the food web, to represent the feeding relationships in the marine ecosystem. However, the student later learns that Organism W's cells do not contain chloroplasts.

Which conclusion would be appropriate, based on the new information?

- Ⓐ Another organism in the marine ecosystem is a producer.
- Ⓑ Organism W is a secondary consumer in the marine ecosystem.
- Ⓒ The role of Organism T in the marine ecosystem changes during its life.
- Ⓓ This marine ecosystem does not have any producers.

Which similarity in two mammals provides the *best* evidence that the mammals are closely related?

- Ⓐ They have similar feeding mechanisms.
- Ⓑ They have similar methods of processing ATP.
- Ⓒ They live in similar habitats.
- Ⓓ They share similar DNA base pair sequencing.

Corals are marine organisms that have symbiotic algae living in their tissues. The algae make food using the energy from sunlight. Sometimes, "coral bleaching" occurs when the algae leave the coral tissues. It is believed that different factors such as a change in temperature or sediments blocking sunlight could cause this coral bleaching to occur.

A student plans to study the factors that could cause coral bleaching in the lab. The student plans to grow corals in five different aquariums with different water temperatures and amounts of light. The coral is collected from water that is 24 °C. The student's setup is shown. During a peer review, the student's classmate says that it is good that the student has a control, but advises him to change the setup before starting the experiment.

Which statement *best* describes how the student should change the experiment?

Coral Study Setup

Aquarium	Water temperature (°C)	Amount of light exposure
1	22	25% light
2	23	50% light
3 (control)	24	100%
4	25	50% light
5	26	25% light

- (A) The student should expose Aquarium 3 to 25% light.
- (B) The student should raise the temperature 2 degrees in Aquarium 3.
- (C) The student should reduce the light and temperatures in the five aquariums.
- (D) The student should vary the temperatures and have 100% light in the five aquariums.

23

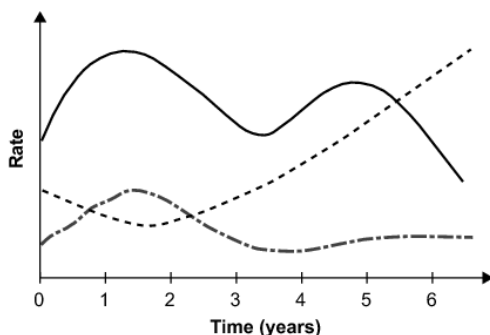


Farmers often spray chemicals on their fields to kill weeds. These chemicals may also harm the crops. Scientists have altered the DNA of some crops so that they will not be harmed by these chemicals. However, some of the weeds can cross-breed with the crops.

Which statement describes a negative consequence of altering the DNA of the crops?

- (A) The amount of chemical needed for the crop fields would increase.
- (B) The amount of crops grown in a field would decrease.
- (C) The weeds could become resistant to the chemicals.
- (D) The weeds could become smaller than the crops.

Population Factors Affecting a Rare Bird Species in a Regional Preserve



Key	
Birth rate	-----
Death rate	—————
Emigration rate	- · - · - · -

An ecologist studied a rare bird species within a regional wildlife preserve for several years. The graph shows the data the ecologist collected on the birth rate, death rate, and emigration rate for the bird species.

During which time period did the bird population experience the largest decline?

- (A) Between Years 0 and 1
- (B) Between Years 1 and 2
- (C) Between Years 3 and 4
- (D) Between Years 4 and 5

Which statement describes the potassium cycle?

- (A) Potassium is eliminated from organisms by respiration and stored in the atmosphere.
- (B) Potassium is extracted from the atmosphere by animals and stored in the soil.
- (C) Potassium is leached from the soil by rain water and removed through crop harvest.
- (D) Potassium is taken out of plants by bacteria and added back through decomposition.

A student hypothesizes that feeding an adult goldfish more than once a day will make it grow larger. He keeps three adult goldfish in separate 40-liter tanks at 20 °C for four weeks. He feeds the first goldfish once a day, the second twice a day, and the third three times a day.

At the end of the experiment, the student concludes that more food does not make an adult goldfish grow larger. He decides to test a new hypothesis and redesign the experiment.

- A. Place a check mark next to **one** new hypothesis that the student could test.
- B. According to the hypothesis you chose, set up a new experiment by placing labels in the boxes for "Tank Size," "Feeding Frequency," and "Temperature."

- Place only **one** label in each box.
- You may use a label more than once.
- There may be more than one correct answer.
- You do **not** need to use all the labels.

✓	Delete ✕																		
40 liters	A. New Hypothesis <input type="checkbox"/> Adult goldfish grow larger when fed more. <input type="checkbox"/> Adult goldfish grow larger in warmer water. <input type="checkbox"/> Adult goldfish grow larger in more spacious environments.																		
55 liters																			
70 liters	B. New Experimental Setup <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>Goldfish 1</th> <th>Goldfish 2</th> <th>Goldfish 3</th> </tr> </thead> <tbody> <tr> <td>Tank Size:</td> <td>?</td> <td>?</td> <td>?</td> </tr> <tr> <td>Feeding Frequency:</td> <td>?</td> <td>?</td> <td>?</td> </tr> <tr> <td>Temperature:</td> <td>?</td> <td>?</td> <td>?</td> </tr> </tbody> </table>				Goldfish 1	Goldfish 2	Goldfish 3	Tank Size:	?	?	?	Feeding Frequency:	?	?	?	Temperature:	?	?	?
				Goldfish 1	Goldfish 2	Goldfish 3													
Tank Size:	?	?	?																
Feeding Frequency:	?	?	?																
Temperature:	?	?	?																
Once a day																			
Twice a day																			
Three times a day																			
18 °C																			
20 °C																			
22 °C																			

(Questions 27-29 must be reviewed online as they involve video and multiple steps.)

30



A researcher conducts an experiment with fruit flies. He hypothesizes that the allele for white eyes is dominant to the allele for red eyes. He crosses a red-eyed female with a white-eyed male and repeats this pairing five times. All offspring from these pairs have red eyes.

What should the researcher do after obtaining these results?

- (A) Change his data to match his hypothesis.
- (B) Conclude that his data supported his hypothesis.
- (C) Record his data and conclude that his hypothesis is not supported.
- (D) Revise his hypothesis to match his data.

31



In the ocean, most primary producers are found in the top zone of water that stretches from the surface down to a maximum depth of 200 meters. In this zone, sunlight is plentiful, so the growth of primary producers is mostly limited by the amount of nutrients available in the water. The source of these nutrients is decaying plant and animal matter. Nutrients are released into the water as this matter sinks to the bottom of the ocean.

According to the information above, which statement *best* explains why vertical mixing of water is required for efficient cycling of matter through the marine ecosystem?

- (A) Bottom-dwelling consumers have difficulty reaching the zone where the primary producers grow.
- (B) Decomposers act on dead consumers at levels deeper than where the primary producers are found.
- (C) Large consumers such as fish need to live at the same level as the decomposers on which they feed.
- (D) Photosynthetic bacteria can produce nutrients only at levels that have limited amounts of sunlight.

32



In 1935, the cane toad was introduced into Australia to control the population of crop-damaging insects. The cane toad population has increased steadily and rapidly since its introduction. Scientists are now trying to slow the growth of the cane toad population.

Which statement could explain the steady increase in Australia's cane toad population?

- (A) The cane toad lays few eggs.
- (B) The cane toad lives in few habitats.
- (C) The cane toad has few food sources.
- (D) The cane toad has few natural predators.

The stages of mitosis are shown.

Place the label naming the correct stage of mitosis in each blank box.

- You should use each label only once.
- Each blank box should be filled with a label.

Metaphase

Anaphase

Prophase

Interphase

Delete

A type of rodent can have white or brown fur. The allele for white fur is recessive to the allele for brown fur.

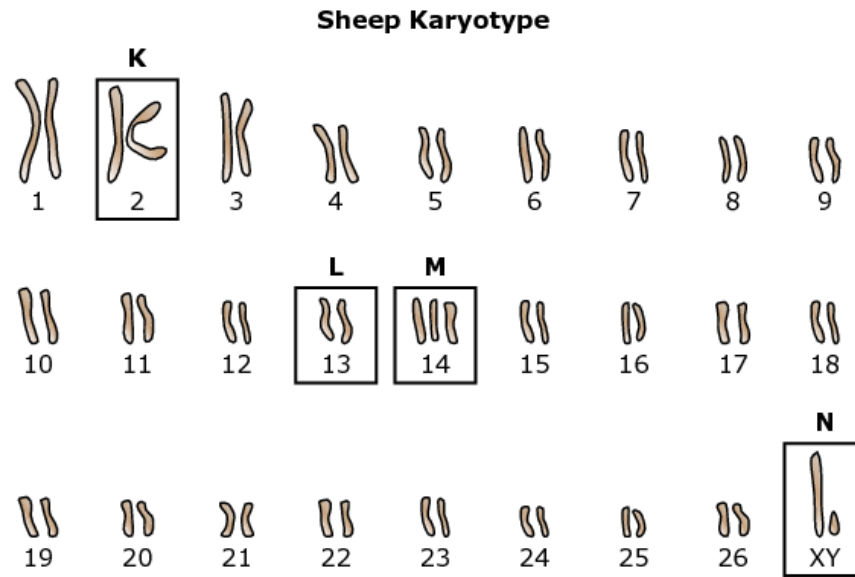
What is the genotype of an individual with white fur?

- (A) Heterozygous dominant
- (B) Heterozygous recessive
- (C) Homozygous recessive
- (D) Homozygous dominant

Question 35

Part A

A wild sheep is observed to have a number of physical ailments. A geneticist takes a cell sample from the sheep and produces the karyotype shown to investigate the cause of these ailments. The geneticist labels four parts of the karyotype as K, L, M, and N.



What is the genetic cause of the sheep's physical ailments, based on information shown in the karyotype?

- (A) The sheep did not receive any dominant alleles from its parents.
- (B) The sheep did not receive the correct combination of chromosomes from its parents.
- (C) The sheep is infected by a virus that is removing essential genes from its DNA.
- (D) The sheep experienced a new selection pressure, which caused multiple insertion mutations.

Part B

Which part of the karyotype provides evidence to support your choice in part A?

- K
- L
- M
- N

A student writes an essay about producing fuel from algae. Select each sentence in the essay that describes a benefit of producing fuel from algae.

Producing Fuel from Algae

Algae are single-celled organisms that obtain their energy through photosynthesis. Some types of algae produce oils that can be used as biofuel. An acre of algae can produce up to 5,000 gallons of oil that can be used as a biofuel. An acre of corn produces up to 420 gallons of fuel and an acre of soybeans produces up to 70 gallons of biofuel.

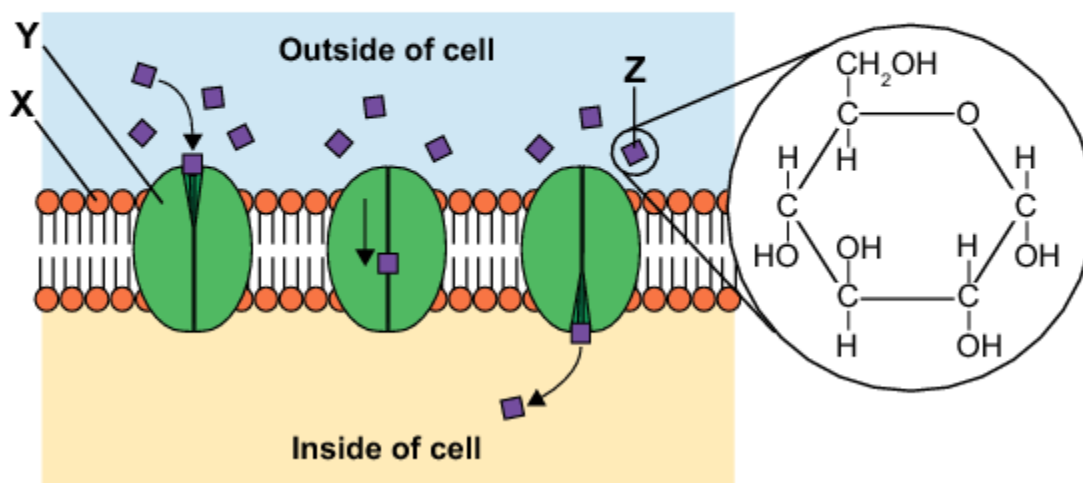
The burning of biofuel releases carbon dioxide into the air, just as burning diesel fuel does. However, algae reduce the amount of carbon dioxide in the air as they are growing. Scientists are trying to determine whether natural or genetically modified strains are best for this new biotechnology. They have to consider the possible risks of using genetically modified strains of algae. If a genetically modified strain of algae were carried into a nearby field, it could displace natural algae. This could alter the ecosystem.

The table shows several biogeochemical cycles.

Select the boxes to match each cycle with the part of Earth that the cycle occurs in.

	Air	Soil	Water
Carbon Cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nitrogen Cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phosphorus Cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The diagram shows a particle moving into a cell membrane.



Select all of the lettered particles in the diagram.

- Amino acid
- Carbohydrate
- Nucleic acid
- Phospholipid
- Protein
- Water

39



The possible phenotypes of cattle are shown in the table. The letters next to each phenotype represent that version of the trait.

Cattle Phenotypes

Dominant Trait	Recessive Trait
Black-haired coat (B)	Red-haired coat (b)
Polled (A)	Horned (a)
White-colored face (F)	Solid-colored face (f)
Solid-colored coat (S)	White-spotted coat (s)
Cloven hooves (H)	Mule feet (h)

Enter letters into the table to identify the genotype of a horned cow with a red-haired coat. Capital letters represent dominant traits and lowercase letters represent recessive traits.

Cow Genotype
<input type="text"/>

40



Which of the following is a gas that soil bacteria convert into a form that plants can use?

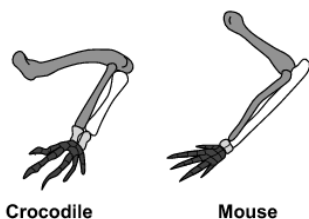
- A Nitrogen
- B Carbon dioxide
- C Oxygen
- D Water vapor

41



The skeletal structures of a crocodile leg and a mouse leg are shown.

What can be hypothesized about crocodiles and mice, based on the skeletal anatomy of these two legs?



Crocodile

Mouse

- A They have long life spans.
- B They have similar diets.
- C They move at a similar speed.
- D They share a common ancestor.

Source: UC Museum of Paleontology's Understanding Evolution (<http://evolution.berkeley.edu>)