

1. An animal cell placed into a 0.9% solute solution would do which of the following?

- A. Remain unchanged
- B. Swell and burst
- C. Shivel
- D. Swell and divide
- E. Release solute by exocytosis

2. When during cell division do chromosomes move to opposite poles of the cell?

- A. When the centrioles replicate
- B. After the nuclear membrane disintegrates
- C. Immediately following DNA replication
- D. When the DNA condenses
- E. Immediately after the centromere splits

3. Convergent evolution can result in all of the following EXCEPT

- A. structures that have similar functions
- B. behaviors that are similar
- C. different species that resemble one another
- D. production of a single species from two originally different species
- E. niches that are similar

4. What structure is common to ALL cell types?

- A. Chloroplast
- B. Plasma membrane
- C. Cell wall
- D. Mitochondria
- E. Flagella

5. A buck with a large, impressive rack of antlers sires four offspring, three males and one female. The three male offspring also have large, impressive antlers, but before being able to reproduce, two of the male offspring get their antlers tangled in a low-hanging tree and are caught and killed by wolves. A second buck with a smaller set of antlers sires three male offspring; all of these males have smaller antlers like their father. They are more effective at escaping predators and successfully reproduce. In terms of evolution, which of the original bucks is more fit?

- A. The buck with the larger antlers because he sired more offspring.
- B. The buck with the smaller antlers because more of his offspring survived.
- C. The buck with the larger antlers because he will be more successful at attracting a mate and continuing to reproduce.
- D. The buck with the smaller antlers because he is more effective at escaping predators and will continue to reproduce.
- E. Both bucks are equally fit.

6. A population of ampicillin-resistant bacteria (Strain 1) is grown in a laboratory and is infected with a virus. The bacterial population begins to decline as the virus initially goes through the lytic cycle, then rebounds as the virus integrates into the bacterial chromosome to begin the lysogenic cycle.

The bacteria reproduce normally until they are heat-shocked. The rapid increase in temperature causes the virus to remove itself from the bacterial genome and enter the lytic cycle. Within several hours all bacteria are dead and a free virus is found in high concentration in the bacterial growth medium.

This free virus is used to infect a population of bacteria that is sensitive to ampicillin (Strain 2). After the expected decrease and rebound of this bacterial population (as above), the rebounded population was found to be ampicillin-resistant.

Evolution of a bacterial population occurs much more rapidly than evolution of a human population. This is because

- A. the bacteria are smaller and thus more susceptible to change
- B. the bacterial life cycle is short and many new generations can be produced quickly
- C. humans do not evolve
- D. humans can only reproduce during a portion of their life cycle, whereas bacteria can reproduce throughout their entire life cycle
- E. bacteria do not require oxygen to survive

7. A population of ampicillin-resistant bacteria (Strain 1) is grown in a laboratory and is infected with a virus. The bacterial population begins to decline as the virus initially goes through the lytic cycle, then rebounds as the virus integrates into the bacterial chromosome to begin the lysogenic cycle.

The bacteria reproduce normally until they are heat-shocked. The rapid increase in temperature causes the virus to remove itself from the bacterial genome and enter the lytic cycle. Within several hours all bacteria are dead and a free virus is found in high concentration in the bacterial growth medium.

This free virus is used to infect a population of bacteria that is sensitive to ampicillin (Strain 2). After the expected decrease and rebound of this bacterial population (as above), the rebounded population was found to be ampicillin-resistant.

The acquisition of ampicillin resistance by bacterial Strain 2 is due to

- A. evolution
- B. speciation
- C. conjugation
- D. transformation
- E. transduction

8. A population of ampicillin-resistant bacteria (Strain 1) is grown in a laboratory and is infected with a virus. The bacterial population begins to decline as the virus initially goes through the lytic cycle, then rebounds as the virus integrates into the bacterial chromosome to begin the lysogenic cycle.

The bacteria reproduce normally until they are heat-shocked. The rapid increase in temperature causes the virus to remove itself from the bacterial genome and enter the lytic cycle. Within several hours all bacteria are dead and a free virus is found in high concentration in the bacterial growth medium.

This free virus is used to infect a population of bacteria that is sensitive to ampicillin (Strain 2). After the expected decrease and rebound of this bacterial population (as above), the rebounded population was found to be ampicillin-resistant.

The bacterial culture is constantly infused with oxygen to ensure a high rate of reproduction among the bacteria and a health

- A. obligate aerobes
- B. obligate anaerobes
- C. tolerant anaerobes
- D. facultative anaerobes
- E. simple anaerobes

9. A population of ampicillin-resistant bacteria (Strain 1) is grown in a laboratory and is infected with a virus. The bacterial population begins to decline as the virus initially goes through the lytic cycle, then rebounds as the virus integrates into the bacterial chromosome to begin the lysogenic cycle.

The bacteria reproduce normally until they are heat-shocked. The rapid increase in temperature causes the virus to remove itself from the bacterial genome and enter the lytic cycle. Within several hours all bacteria are dead and a free virus is found in high concentration in the bacterial growth medium.

This free virus is used to infect a population of bacteria that is sensitive to ampicillin (Strain 2). After the expected decrease and rebound of this bacterial population (as above), the rebounded population was found to be ampicillin-resistant.

Which of the following increase genetic diversity in bacteria?

I. Conjugation

II. Transformation

III. Cross

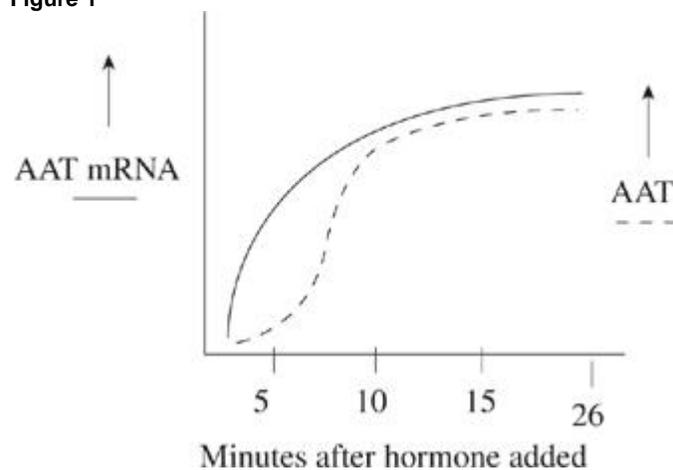
- A. I only
- B. I and II only
- C. III only
- D. II and III only
- E. I, II, and III

10. Questions below refers to the following experiment involving human liver cells.

Aspartate aminotransferase (AAT) is an enzyme produced in liver cells that catalyzes an important step in the metabolism of amino acids. The production of AAT is dependent upon various hormonal stimuli. Human liver cells were cultured; half the cultured cells were used to measure the amount of AAT mRNA present, and half were used to measure the amount of AAT present. Measurements were taken at five-minute intervals following hormonal stimulation of the cells.

Figure 1 shows the results of this experiment.

Figure 1



The experiment was repeated, this time adding an inhibitor of protein synthesis along with the hormone.

Figure 2 shows the results of this experiment.

Figure 2

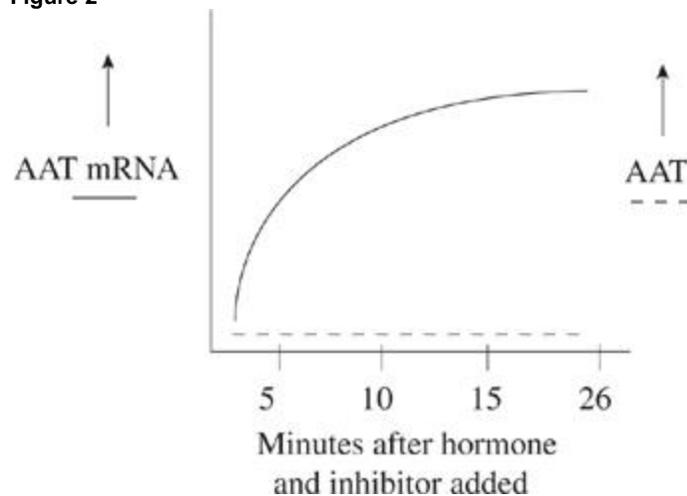


Figure 2 sh

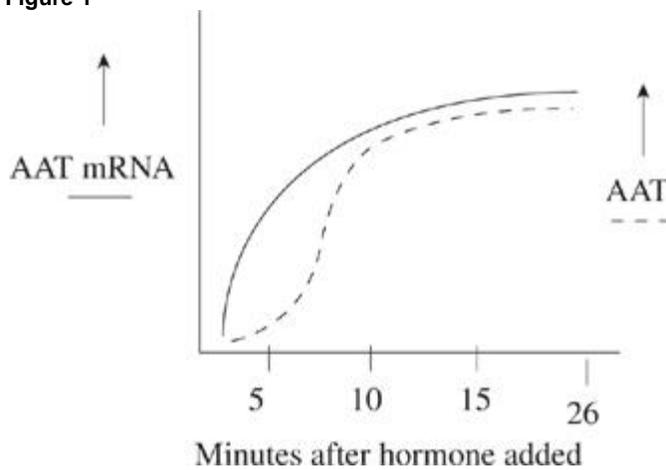
- A. protein
- B. hormone
- C. lipid
- D. inhibitor
- E. amino acid

11. Questions below refers to the following experiment involving human liver cells.

Aspartate aminotransferase (AAT) is an enzyme produced in liver cells that catalyzes an important step in the metabolism of amino acids. The production of AAT is dependent upon various hormonal stimuli. Human liver cells were cultured; half the cultured cells were used to measure the amount of AAT mRNA present, and half were used to measure the amount of AAT present. Measurements were taken at five-minute intervals following hormonal stimulation of the cells.

Figure 1 shows the results of this experiment.

Figure 1



The experiment was repeated, this time adding an inhibitor of protein synthesis along with the hormone.

Figure 2 shows the results of this experiment.

Figure 2

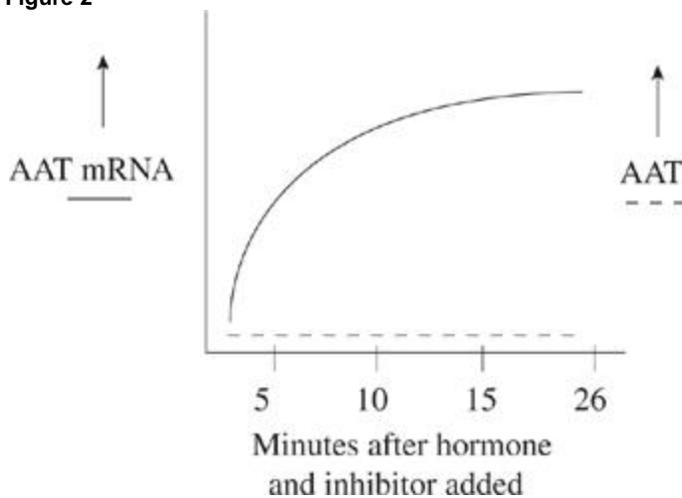


Figure 1 sh

- A. induce protein synthesis
- B. induce RNA transcription

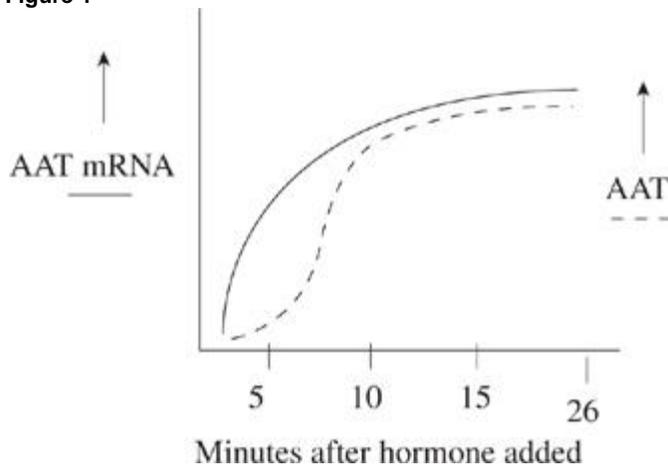
- C. induce DNA replication
- D. inhibit protein synthesis
- E. induce cell division

12. Questions below refers to the following experiment involving human liver cells.

Aspartate aminotransferase (AAT) is an enzyme produced in liver cells that catalyzes an important step in the metabolism of amino acids. The production of AAT is dependent upon various hormonal stimuli. Human liver cells were cultured; half the cultured cells were used to measure the amount of AAT mRNA present, and half were used to measure the amount of AAT present. Measurements were taken at five-minute intervals following hormonal stimulation of the cells.

Figure 1 shows the results of this experiment.

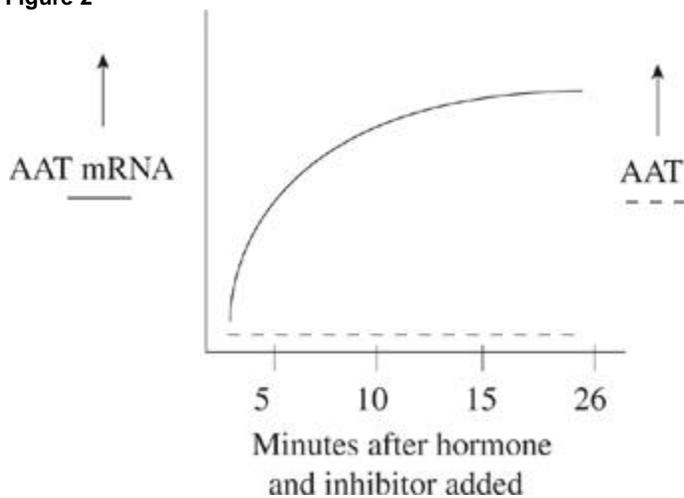
Figure 1



The experiment was repeated, this time adding an inhibitor of protein synthesis along with the hormone.

Figure 2 shows the results of this experiment.

Figure 2



The enzyme

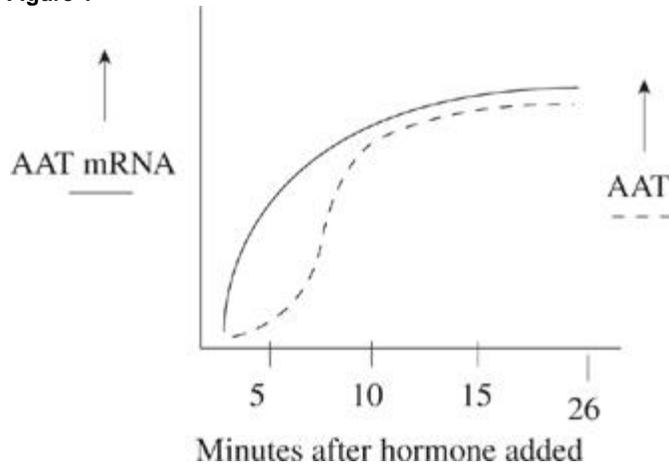
- A. mRNA production does not require an enzyme
- B. mRNA is not a protein
- C. the enzyme needed to make mRNA is not a protein
- D. the enzyme needed to make mRNA still needs to be translated
- E. the enzyme needed to make mRNA is already present in the cell

13. Questions below refers to the following experiment involving human liver cells.

Aspartate aminotransferase (AAT) is an enzyme produced in liver cells that catalyzes an important step in the metabolism of amino acids. The production of AAT is dependent upon various hormonal stimuli. Human liver cells were cultured; half the cultured cells were used to measure the amount of AAT mRNA present, and half were used to measure the amount of AAT present. Measurements were taken at five-minute intervals following hormonal stimulation of the cells.

Figure 1 shows the results of this experiment.

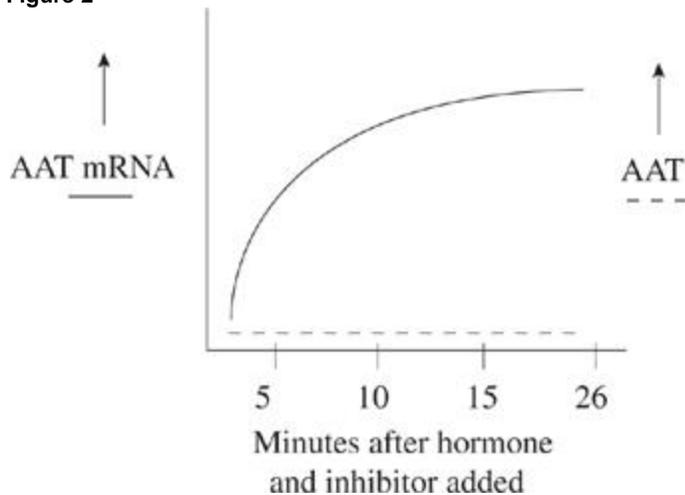
Figure 1



The experiment was repeated, this time adding an inhibitor of protein synthesis along with the hormone.

Figure 2 shows the results of this experiment.

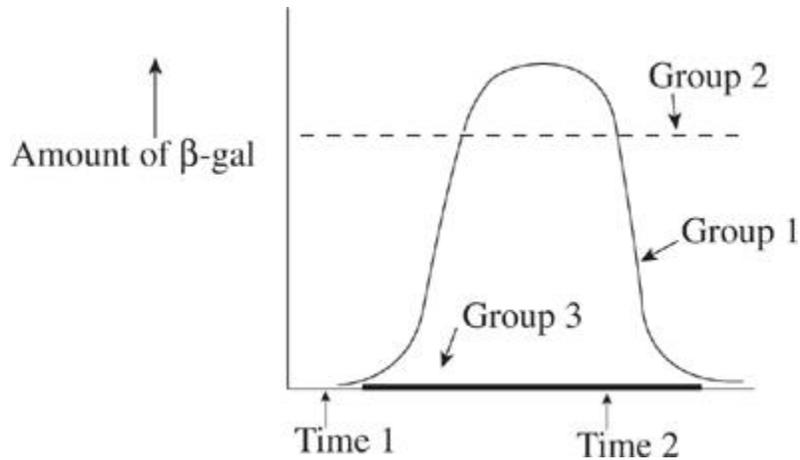
Figure 2



Consider Fi

- A. Immediately upon addition of hormone
- B. 1 minute after addition of hormone
- C. 3 minutes after addition of hormone
- D. 8 minutes after addition of hormone
- E. 20 minutes after addition of hormone

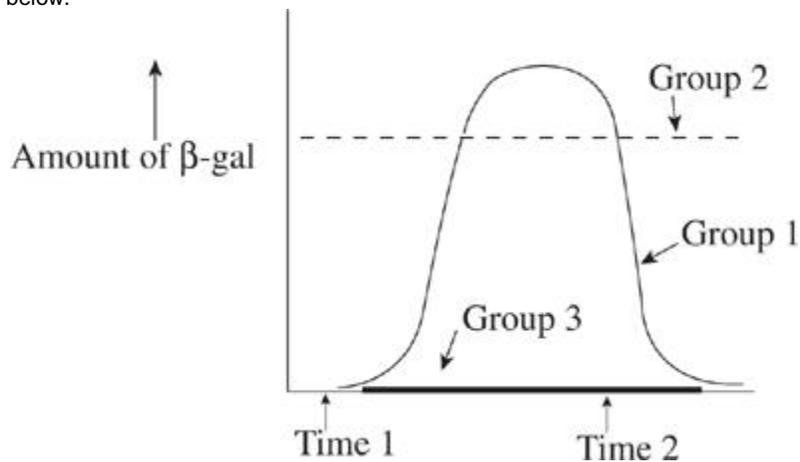
14. β -galactosidase (β -gal) is a bacterial enzyme used in the metabolism of lactose. Three different groups of human intestinal bacteria were cultured in a glucose-based medium. At Time 1, the bacteria were transferred to media containing lactose as a nutrient source instead of glucose. At Time 2, the bacteria were returned to the glucose-based medium. Samples of bacteria were removed at five-minute intervals and tested for the presence of β -gal. The results are presented below.



What could account for the delay in β -gal production after Time 1 seen in Group 1 ?

- A. An inability to synthesize β -gal
- B. Transcription of β -gal mRNA
- C. Continued use of glucose as a nutrient
- D. Replication of the bacterial DNA
- E. Infection by a virus

15. β -galactosidase (β -gal) is a bacterial enzyme used in the metabolism of lactose. Three different groups of human intestinal bacteria were cultured in a glucose-based medium. At Time 1, the bacteria were transferred to media containing lactose as a nutrient source instead of glucose. At Time 2, the bacteria were returned to the glucose-based medium. Samples of bacteria were removed at five-minute intervals and tested for the presence of β -gal. The results are presented below.

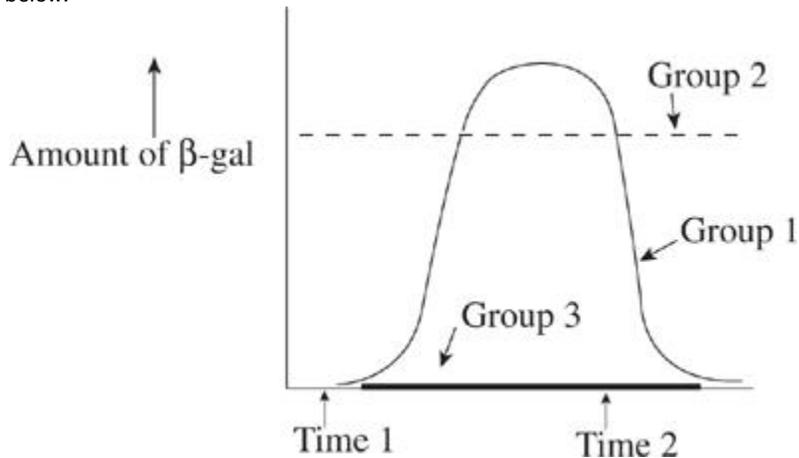


Why is it an advantage to intestinal bacteria to be able to induce β -gal production in this way?

- A. Humans do not consume foods containing lactose all the time.
- B. It prevents toxic buildup of lactic acid.
- C. β -gal is harmful to bacteria.
- D. It prevents the bacteria from using glucose as a nutrient source.
- E. Lactose is harmful to bacteria.

16. β -galactosidase (β -gal) is a bacterial enzyme used in the metabolism of lactose. Three different groups of human intestinal bacteria were cultured in a glucose-based medium. At Time 1, the bacteria were transferred to media containing

lactose as a nutrient source instead of glucose. At Time 2, the bacteria were returned to the glucose-based medium. Samples of bacteria were removed at five-minute intervals and tested for the presence of β -gal. The results are presented below.



Which of the following could be reasons for the inability of Group 3 to produce β -gal?

- I. Error in DNA replication
- II. Error in RNA transcription
- III. Error in protein translation

- A. I only
- B. III only
- C. I and II only
- D. II and III only
- E. I, II, and III

17. Situation 1: A species of moth is preyed on by bats. Over hundreds and hundreds of years, the moths develop a sophisticated pattern of flying when they hear the screech of a bat. This helps them escape danger. Other changes occur as well, and when an attempt is made to mate the current moth with its ancestor moth, no viable eggs are produced.

Situation 2: A species of frogs is living in a pond near an earthquake fault line. A sizable earthquake separates the frog population into two separate populations. After hundreds and hundreds of years, the two groups are unable to mate.

Consider Situation 2. Because the two groups of frogs are unable to mate, they are now considered to be different

- A. populations
- B. communities
- C. species
- D. organisms
- E. amphibians

18. Situation 1: A species of moth is preyed on by bats. Over hundreds and hundreds of years, the moths develop a sophisticated pattern of flying when they hear the screech of a bat. This helps them escape danger. Other changes occur as well, and when an attempt is made to mate the current moth with its ancestor moth, no viable eggs are produced.

Situation 2: A species of frogs is living in a pond near an earthquake fault line. A sizable earthquake separates the frog population into two separate populations. After hundreds and hundreds of years, the two groups are unable to mate.

A similarity between Situation 1 and Situation 2 is

- A. reproductive isolation
- B. genetic drift

- C. increased fitness
- D. geographic separation
- E. competition

19. Situation 1: A species of moth is preyed on by bats. Over hundreds and hundreds of years, the moths develop a sophisticated pattern of flying when they hear the screech of a bat. This helps them escape danger. Other changes occur as well, and when an attempt is made to mate the current moth with its ancestor moth, no viable eggs are produced.

Situation 2: A species of frogs is living in a pond near an earthquake fault line. A sizable earthquake separates the frog population into two separate populations. After hundreds and hundreds of years, the two groups are unable to mate.

Another term used to describe what happened in Situation 2 is

- A. survival of the fittest
- B. convergent evolution
- C. divergent evolution
- D. stabilizing selection
- E. directional selection

20. Situation 1: A species of moth is preyed on by bats. Over hundreds and hundreds of years, the moths develop a sophisticated pattern of flying when they hear the screech of a bat. This helps them escape danger. Other changes occur as well, and when an attempt is made to mate the current moth with its ancestor moth, no viable eggs are produced.

Situation 2: A species of frogs is living in a pond near an earthquake fault line. A sizable earthquake separates the frog population into two separate populations. After hundreds and hundreds of years, the two groups are unable to mate.

If the earthquake in Situation 2 left one group of frogs without a water source, would the frogs be able to survive and reproduce?

- A. No, frogs are amphibians and can live only in water.
- B. No, frog eggs must be laid in water because they lack a shell.
- C. Yes, because amphibians frogs can live on both land and water.
- D. Yes, frogs have a thick scaly skin, which protects them from dehydration.
- E. Yes, the frogs would quickly adapt to the new environment.