

Unit Test: Evidence for Evolution

Read each question. Circle the letter of the correct answer.

1. Scientists have discovered several species of insect that all contain the DNA sequence ATTACGCGATC on their second chromosome. What does this evidence suggest?

- A. similar feeding habits
- B. susceptibility to habitat loss
- C. genetic basis of photosynthesis
- D. common ancestry among organisms

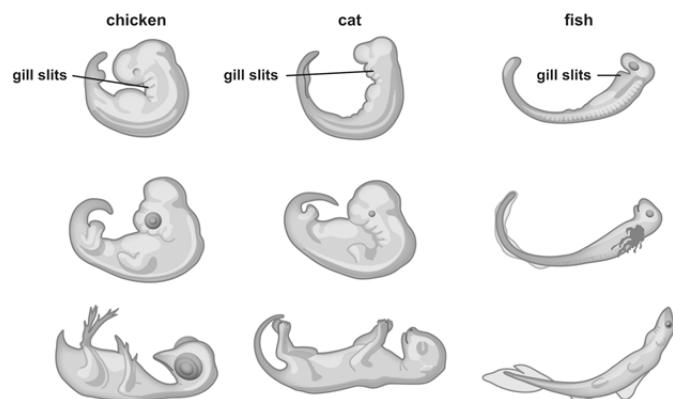
2. A scientist has found fossils of an organism that she suspects is related to a living vertebrate species, but it has different physical characteristics. The fossil is dated at 10 million years old. The scientist wishes to look for a transitional species between the fossil organism and the living vertebrate species. Which location would be the best to find fossils of a transitional species?

- A. in volcanic rock that is dated at 5 million years old
- B. in sedimentary rock that is dated at 5 million years old
- C. in volcanic rock that is dated at 20 million years old
- D. in sedimentary rock that is dated at 20 million years old

3. Which event shows conditions that lead to natural selection?

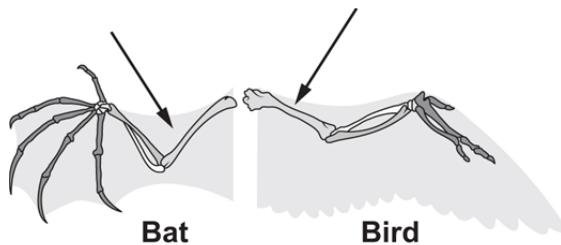
- A. Weeds are removed by a gardener from a public park.
- B. Wild horses are tamed over many years and selectively allowed to reproduce.
- C. A crab produces millions of offspring in a year, but few survive to adulthood.
- D. Farmers collect the largest corn seeds to plant in their fields the following year.

4. A scientist presented the information in the illustration as part of a report on the evolution of species. How does the information support the claim of common ancestry?



- A. It shows many similar traits exist during development.
- B. It suggests that chickens and cats will both lose their gills.
- C. It allows for the genetics of each species to be examined in more detail.
- D. It provides information about what the ancient form of both organisms looked like.

5. Although flight evolved separately in bats and birds, their forelimbs are considered homologous.



What does this information suggest about the relationship between bats and birds?

- A. While birds and bats do have a common ancestor, wings evolved separately in the two species.
- B. The fact that birds and bats have the same bones in their wings shows that they must be closely related.
- C. Differences in the structures of the wings of birds and bats suggest that they do not have a common ancestor.
- D. Wings in birds and bats provide little evidence for common ancestry but offer plausible explanations for a connection to winged dinosaurs.

6. Which of these is an example of an environment in which natural selection would not occur?
- A. All offspring have the same chance of survival.
 - B. Offspring inherit beneficial and detrimental traits from parents.
 - C. Some offspring have a physical trait that helps the organism compete more successfully.
 - D. There is genetic diversity in the population due to mutation and/or sexual reproduction.
7. Which area of biology provides evidence that organisms are continuing to evolve in modern times?
- A. studies of human impact on endangered animal population numbers
 - B. investigations leading to new vaccines every year to fight infections from the influenza virus
 - C. research into the nature of stem cells for the purpose of replacing damaged tissues and organs
 - D. analysis of fossilized remains of organisms using new techniques that can determine genetic information
8. In some species of anglerfish, the male fish are parasites of the females. When a male anglerfish comes into contact with a female, he bites her body and eventually fuses with her, losing all internal organs except for his testes. Which of these best explains why this relationship exists?
- A. It ensures that all offspring will be genetically identical.
 - B. It reduces the amount of resources available to anglerfish females.
 - C. It increases the reproductive success of anglerfish females and males.
 - D. It benefits male anglerfish survival while harming female anglerfish.

9. Annalisa is studying the fossilized remains of extinct organisms shown.



She notices that each of these species has a segmented body, similar to modern arthropods, such as lobsters and spiders. Which statement is the most likely explanation for this observation?

- A. The organisms evolved to mimic modern arthropods.
 - B. The organisms share a common ancestry with modern arthropods.
 - C. The organisms lived at a time when modern arthropods also lived.
10. The image shows a fossil of *Archaeopteryx*, thought to be the first fully feathered dinosaur.



How does this piece of evidence support the theory of evolution?

- A. It suggests that dinosaurs evolved from modern birds.
- B. It suggests that birds and dinosaurs have a common ancestor.
- C. It suggests that the bone structures of birds are different from those of dinosaurs.
- D. It suggests that birds and dinosaurs were alive at the same time during geologic history.

Read each question. Follow the instructions to answer the questions.

- 11.** Different lines of evidence may be used when determining whether two species are related. Write one letter in each blank to correctly complete the paragraph.

Details from fossils help link species. Examples of such details include _____ structures, which are similar structures that have different functions in different organisms. In addition, molecular evidence such as _____ sequences provides further evidence for the relationship between two species.

- | | |
|---------------------|-------------------------|
| A. DNA | D. homologous |
| B. vestigial | E. carbohydrate |
| C. analogous | F. cell membrane |

- 12.** A population of white rabbits migrates to a new environment with much less snow. When the population is observed many generations later, the majority of the population is now brown. How did this adaptation most likely occur? Number the statements in the correct order.

- _____ The brown fur gene becomes more prevalent in the population.
_____ The population of rabbits randomly mates, increasing genetic diversity.
_____ Offspring with the brown fur gene have more success surviving and mating.
_____ Brown fur provides better camouflage in the new environment for the individual.
_____ The brown individual successfully breeds and passes on the gene for brown fur.
_____ An individual in the population grows brown fur because of a randomly generated gene.

- 13.** Write the letter of the words next to the statements that describe them.

Heritable differences exist in every population.	
Traits develop that are well suited for survival and reproduction.	
More offspring are produced than can survive and reproduce.	
Some individuals survive and reproduce better than other individuals in their environment.	

- | |
|--------------------------|
| A. adaptation |
| B. competition |
| C. overproduction |
| D. variation |

- 14.** Draw a circle around the letters of all statements that provide evidence of common ancestry.
- Wombats occupy similar ecological niches to woodchucks.
 - The embryos of chicken and turtles are very similar in appearance.
 - The wings of birds and the wings of bees perform similar functions.
 - DNA sequences of developmental genes are similar in flies and vertebrates.
 - The arrangement of bones in a bat wing is similar to the arrangement of bones in a monkey's forelimb.
- 15.** Write the letter of each statement in the correct position in the table to show whether it is an example of natural or artificial selection.

Natural Selection	Artificial Selection

- Farmers grow the same species of corn year after year.
- A lion hunts members of the same gazelle herd over a month.
- Only cattle with the calmest temperaments are allowed to reproduce.
- Female birds breed only with males that perform an elaborate mating ritual.

- 16.** Write an X in the correct box in the table to show which conclusion was best supported by each of Darwin's observations.

Observation	Species adapt to their surroundings.	Modern animals are related to fossil forms.	Geologic processes add up to great change over time.
A. A fossil of an extinct species looked very similar to an armadillo.			
B. Fossils of marine organisms are located on a mountain far above sea level.			
C. Several species of closely related birds that have significant physical differences live on an island.			

17. The data tables show the number of individuals in a lizard population exhibiting certain traits before and after a ten-year drought.

Skin color	Before drought	After drought
Green skin	112	91
Brown skin	26	24

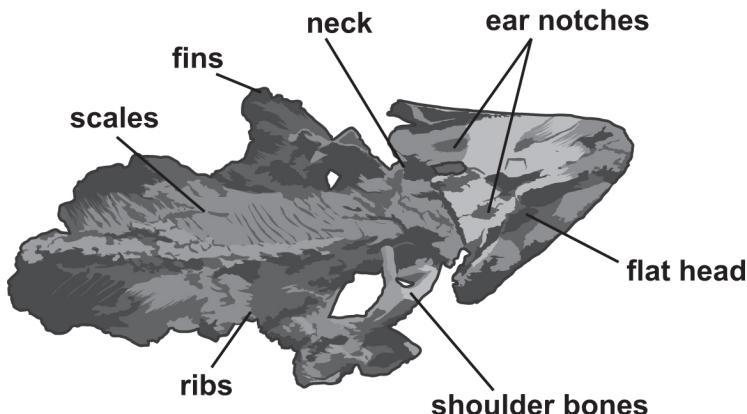
Body size	Before drought	After drought
Body >3 inches long	70	28
Body <3 inches long	68	87

What conclusions are supported by the data? Circle the letters of all correct answers.

- A. Brown-skinned lizards may have been affected less by the drought conditions.
- B. Larger-bodied lizards may have been naturally selected for by the drought conditions.
- C. Green-skinned lizards seem to have been naturally selected for by the drought conditions.
- D. Smaller-bodied lizards seem to have been naturally selected for by the drought conditions.
- E. Not enough lizards were killed off by the drought to determine natural selection's effects.

Read each statement. Write your answer on the lines.

- 18.** Fossil evidence is just one of several pieces of evidence biologists use to study common ancestry among organisms. The illustration shows a fossil of *Tiktaalik*, an animal that lived about 375 million years ago.



Explain how this fossil can be used to show common ancestry between fishes and tetrapods.

It was thought that early land animals used only their front limbs to move on land. It was recently discovered that *Tiktaalik* had developed pelvic bones that allowed it to move its hind limbs more than previously thought.

Explain the significance of this discovery in regard to understanding early land animals.

- 19.** In addition to developmental and genetic evidence, evolution and ideas about common ancestry can be established using geologic evidence.

Explain how the discovery of fossils in different layers of Earth can lead to knowledge of species evolution.

Explain whether geologic evidence will still be able to be used in a hundred years.

- 20.** A researcher studied the development of resistance to antibiotics by bacteria. She studied several antibiotics to determine how long it took for bacteria to develop resistance. She found that, on average, it took eight years for bacteria to develop resistance to an antibiotic. In some cases, bacteria developed resistance to an antibiotic within a year, and none of the antibiotics were still completely effective on bacteria after 30 years.

Describe how mutations and natural selection can lead to resistant populations of bacteria.

When medical professionals encounter a disease, they often have to make an ethical decision about the prescription of an antibiotic. Explain how the information in the paragraph supports the use of restraint when prescribing antibiotics.

- 21.** In one species of lake fish, the males are more brightly colored than the females. Females of this species prefer the males with the brightest colors. However, males with brighter colors are more easily seen by predator fish. A scientist who is studying the fish creates three model lakes, lake A, lake B, and lake C, and places equal-sized populations of the fish in each lake. In lake A, the scientist places predator fish in their normal population density. In lake B, the scientist places predator fish at twice their normal population density. The scientist does not place any predator fish in lake C. The scientist then maintains the model lakes for five years, observing any changes in the populations of the lake fish.

Explain how the males in the fish populations of lakes B and C would be expected to change in comparison with the population in lake A.

After the five-year period, the population of lake C was moved to lake B. Predict how the survival of the fish will be affected.

Directions: Read the passage, then answer the questions that follow.

Eye Development Genes

Mice and fruit flies both have eye structures that carry out the same function. They also both have genes that direct the development of their eyes during embryonic development. The figure shows a portion of a gene that is essential for normal eye development in mice and another that is essential for normal eye development in fruit flies.

mouse gene: GTATCCAACGGTTGTGAGTAAAATTCTGGCAGGTATTACGAGACTGGCTCCATCAGA

fly gene: GTATCAAATGGATGTGAGCAAAATTCTCGGGAGGTATTATGAAACAGGAAGCATACGA

Notes: 76.77% of the bases are identical in these two sequences.

100% of the amino acids coded by the bases in these two sequences are identical.

- 22.** Scientists have carried out additional experiments involving the eye gene found in both mice and fruit flies. The following observations were made:

- If the mouse gene is absent in a mouse embryo, no eye forms.
- If the fruit fly gene is absent in a fruit fly embryo, no eye forms.
- If the mouse gene is used to replace the fruit fly gene in a fruit fly embryo, the fruit fly grows normal fruit fly eyes.
- If the fruit fly gene is used to replace the mouse gene in a mouse embryo, the mouse grows normal mouse eyes.

A student is writing a summary after reviewing these results. Write one letter in each blank to correctly complete the sentences.

Both genetic and 1. _____ evidence is present to support the conclusion that fruit flies and mice share a common ancestor. The development of their different body plans is controlled by differences in their 2. _____ genes.

1. A. anatomical B. developmental C. physiological	2. D. homeobox E. mutated F. pseudo
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23. The gene for eye development in mice is called *Pax6*. The gene for eye development in fruit flies is called *eyeless*. Searches within the genomes of other animals revealed that a similar gene sequence could be located in animals with eye structures. The figure shows some of these gene sequences.

Mouse *Pax6* gene:

GTATCAAATGGATGTGAGCAAAATTCTCGGGAGGTATTATGAAACAGGAAGCATAACGA

Fly *eyeless* gene:

GTATCAAATGGATGTGAGCAAAATTCTCGGGAGGTATTATGAAACAGGAAGCATAACGA

Genetic similarity to mouse: 76.66% Protein similarity to mouse: 100%

Gene from organism X:

GTGTCCAACGGTTGTGTCAAGAAAATCCTGGGCAGATACTATGAAACAGGATCCATCAGA

Genetic similarity to mouse: 85.00% Protein similarity to mouse: 100%

Gene from organism Y:

GTCTCCAACGGCTGCCTAGCAAGATTCTGGACGGTACTATGAGACGGCTCCATAAGA

Genetic similarity to mouse: 78.33% Protein similarity to mouse: 100%

Gene from organism Z:

GTGTCTAACGGTTGTGTTAGAAAAACTTTGCCGATATTATGGAACAGGTTCTATTAAA

Genetic similarity to mouse: 71.66% Protein similarity to mouse: 100%

Number the genes from 1 to 4, with 1 being most closely related and 4 being least related to the mouse gene.

_____ eyeless gene

_____ gene from organism X

_____ gene from organism Y

_____ gene from organism Z

24. Several hypotheses have been proposed concerning evolutionary processes. Which of these hypotheses are supported by the data presented in the passage? Circle the letters of the two correct statements.

- A. Only very closely related species will have a nearly identical amino acid sequence for a given protein.
- B. Evolutionary relatedness is ruled out between species if their gene sequences overlap but are not identical.
- C. Having similar amino acid sequence in proteins with similar functions in two species indicates a common ancestor between the species.
- D. Homologous genes in distantly related animals will show fewer differences in sequence than will the proteins for which the genes code.
- E. Genes isolated from cells of different species that contain similar sequences of nucleic acids are evidence of common evolutionary ancestry.

25. Scientists have studied the eye structures and eye development of many modern animals. They made three primary observations:

1. All animal eye structures detect light.
2. The eye structures of most animal groups are complex but differ as shown in the table.
3. A gene controlling eye development is found in all animals with eye structures, and this gene is homologous across all animal groups.

The scientists compared the eye structures and genes of vertebrates and insects. Their results are shown in the table.

	Eye structures	Genes encoding eye structures	Eye developmental genes
Comparison of vertebrates to other vertebrates	homologous	homologous	homologous
Comparison of vertebrates to insects	analogous	analogous	homologous

When the theory of evolution was first proposed, many claimed that vertebrates and insects could not have evolved from a common ancestor because their body parts, such as eyes, differ so greatly. Write your answer on the lines.

Use evidence presented here to support the argument that vertebrates and insects evolved from a common ancestor.

Explain why the development of gene sequencing technology provided a turning point in evidence gathering related to this claim.

Predict how the eye structures and genes controlling eye development in animal species in the future might be expected to compare to those of animals of today.
