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4-1 What is evolution?

Lesson Review

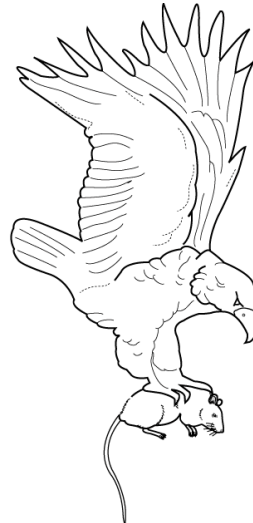
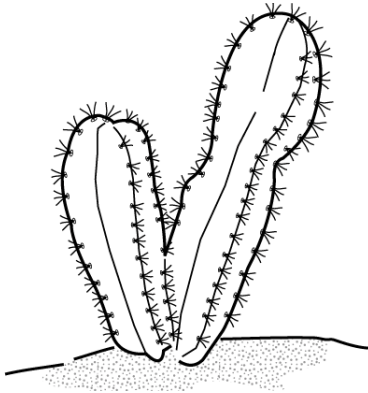
Write *true* if the statement is true. If the statement is false, change the underlined term to make the statement true.

- _____ 1. Many scientists believe that new species develop from older species as a result of adaptation.
- _____ 2. A change in a gene is called a mutation.
- _____ 3. A trait of an organism that helps it survive in its environment is called an evolution.
- _____ 4. The process by which organisms change throughout time is called evolution.
- _____ 5. A group of organisms that look alike and can reproduce among themselves are a species.
- _____ 6. If a mutation is helpful to an organism, it may die out before passing the trait on.

Skill Challenge

Skills: analyzing, relating concepts

Study the diagrams shown below. On the lines provided, explain what features the cactus and the hawk have that allow it to survive in its environment.



4-2 What are fossils?

Lesson Review

Write the term that best completes each sentence in the space provided.

1. Species of organisms that are no longer found living are _____ .
2. The remains or traces of once-living organisms are _____ .
3. Most fossils are found in layers of _____ rock.
4. An elephant-like animal called a _____ has been found frozen in ice.
5. Insects are often preserved in hardened tree sap called _____ .
6. When an organism is buried in rock, it decays and leaves a cavity called a _____ .
7. When a mold fills with sand or mud and then hardens, a _____ is formed.
8. Sediments are slowly changed to rock as _____ forces the sediments together.

Skill Challenge

Skills: *identifying, relating concepts*

Answer the questions about the drawings shown.

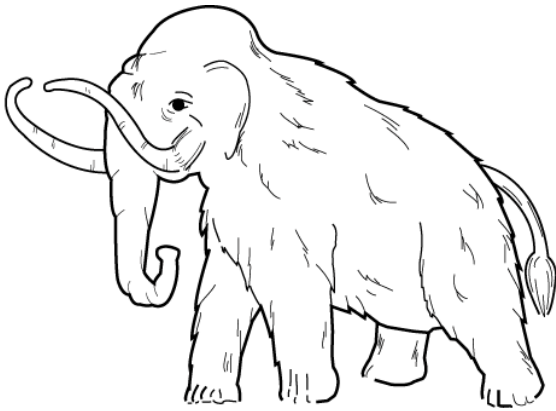


Figure 1



Figure 2

1. What organism is shown in Figure 1? _____
2. In what way is the organism in Figure 1 most likely to be preserved? _____
3. Is the organism in Figure 1 an example of a living or an extinct species? _____
4. What organism is shown in Figure 2? _____
5. How is the organism in Figure 2 most likely to be preserved? _____
6. Is the organism in Figure 2 an example of a living species or an extinct species? _____

Kinds of Fossils

Enrichment Activity for Lesson 4-2

Skills: comparing, relating

PART A Read the passage. Then, answer the questions that follow.

Molds and Casts

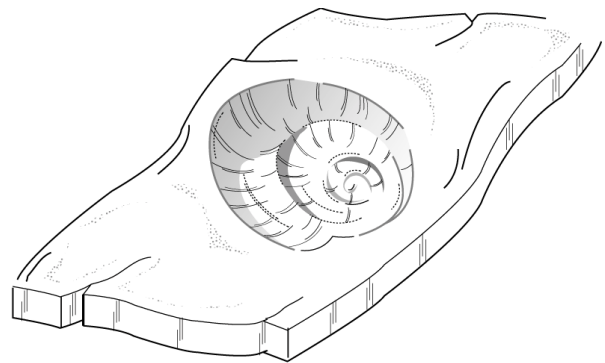
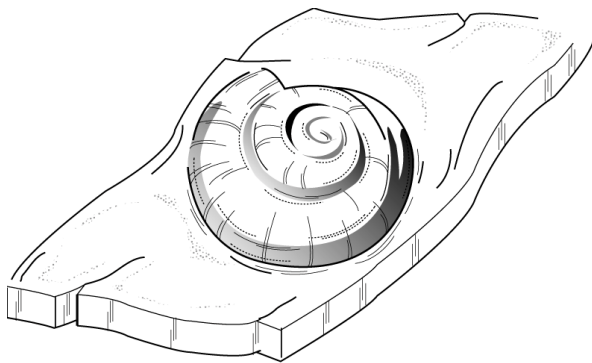
Fossils often form when silt or mud covers an organism or part of an organism. The silt or mud hardens before the organism decays. As the organism decays, a fossil remains. A fossil mold is formed if a cavity is left in rock that has the shape of the organism. A fossil cast forms if sediment fills the mold and then hardens.

1. What is a fossil mold? _____

2. What is a fossil cast? _____

3. Is it possible for a fossil cast to form without a fossil mold? Why or why not? _____

PART B Identify the fossils below as either a fossil mold or a fossil cast.



1. _____

2. _____

4-3 What evidence supports evolution?

Lesson Review

Complete the following.

1. What does fossil evidence show about Earth's climate? _____
2. For what animal is the most complete fossil record available? _____
3. Describe how the horse has evolved. _____

4. What are homologous structures? _____

5. Name three homologous structures. _____

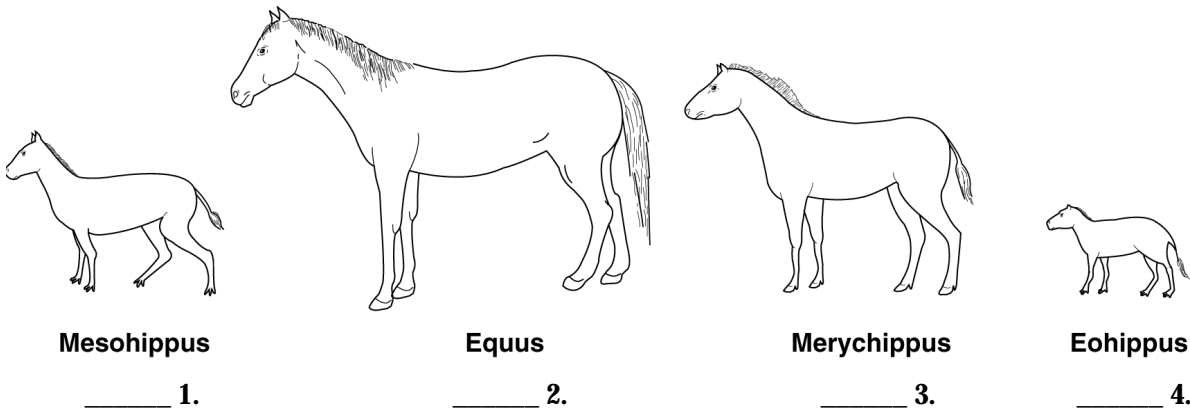
6. What are vestigial structures? _____

7. How do scientists know that dogs and bears are closely related? _____

Skill Challenge

Skills: sequencing, generalizing

Place the diagrams of horse evolution below in the correct order by writing the letter *A* (earliest horse) through *D* (most recent horse) in the spaces provided. Then, answer the question.



5. What generalization can you make about how horses have changed through time? _____

Radioactive Dating

Enrichment Activity for Lesson 4-3

Skills: relating, calculating

PART A Read the passage. Then, answer the questions that follow.

Radioactive Dating

In the 1940s, scientists discovered that radioactive elements can be used to find out how long ago a fossil organism lived. This method is called radioactive dating. The actual age of a fossil can be identified using it. Radioactive elements give off particles and energy as they decay. They decay at a fixed rate that can be measured. Scientists measure the rate of radioactive decay in a unit called a half-life. A half-life is the amount of time needed for one-half of the radioactive element to decay. By measuring the amount of a particular radioactive element in a fossil, the number of half-lives of the element is found. This is used to calculate the actual age of the fossil.

1. What is radioactive dating? _____

2. What is a half-life? _____

PART B The table below lists the half-lives of certain radioactive elements. Use the table to answer the questions that follow.

HALF-LIVES	
Radioactive Element	Half-life
Rubidium-87	50 billion years
Uranium-238	4.5 billion years
Potassium-40	1.3 billion years
Carbon-14	5,770 years

1. What is the half-life of uranium-238? _____
2. Suppose a fossil contained one-half as much carbon-14 as when the organism first formed. How old is the fossil? _____
3. Suppose a rock contained one-fourth as much potassium-40 as when it first formed. How old is the rock? _____
4. If 10 g of uranium-238 are present now, how much will be left in 4.5 billion years? How much in 9 billion years? _____
5. If 40 g of rubidium-87 are present now, how much will be left in 100 billion years? _____

4-4 What is natural selection?

Lesson Review

PART A Answer the following questions.

1. Who was Jean Baptiste de Lamark? _____

2. What was Jean Baptiste de Lamark's theory about evolution? _____

PART B The main ideas of Darwin's theory of natural selection are listed below. Explain what is meant by each of these ideas.

1. **Overproduction:** _____

2. **Struggle for Existence:** _____

3. **Variation:** _____

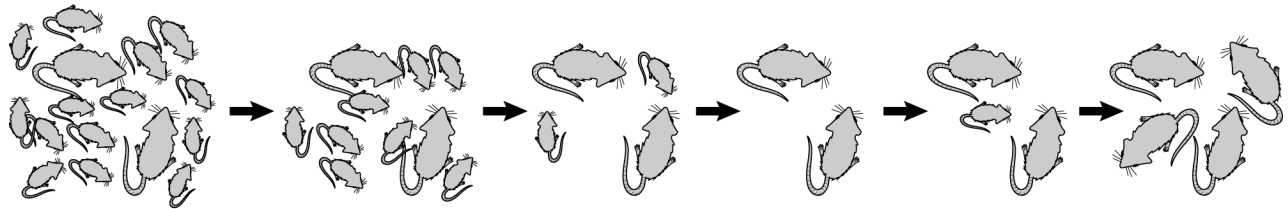
4. **Survival of the Fittest:** _____

5. **Evolution of New Species:** _____

Skill Challenge

Skills: applying concepts, analyzing

Study the diagrams below. Identify how the diagrams relate to Darwin's ideas about natural selection.



4-5 How does the environment affect natural selection?

Lesson Review

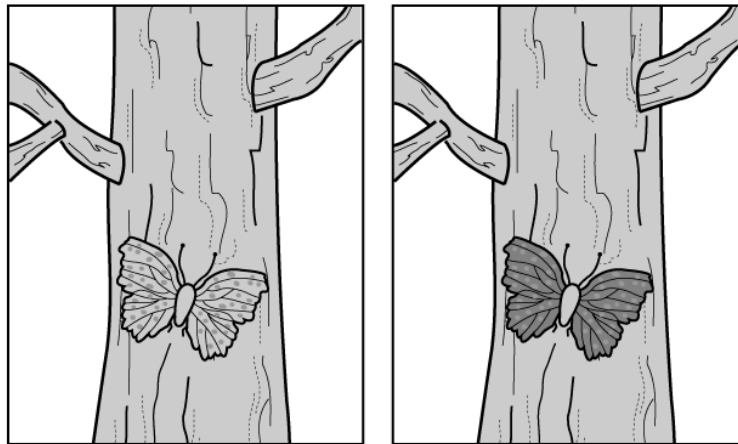
Write *true* if the statement is true. If the statement is false, change the underlined term to make the statement true.

- _____ 1. All organisms must have a living space that provides food, water, and shelter.
- _____ 2. Tigers that are slower and weaker are more likely to catch deer and survive.
- _____ 3. Human activities cannot produce great changes in the living spaces of other organisms.
- _____ 4. Extinction is an example of how harmful materials from factories and cars pollute the air, water, and land.
- _____ 5. After laws were passed in England to reduce air pollution, the number of gray peppered moths rose.
- _____ 6. Extinction is the disappearance of all members of a species.
- _____ 7. The giant panda and the grizzly bear are both examples of extinct species.

Skill Challenge

Skills: *identifying, relating concepts*

Answer the questions about the drawings shown below.



Gray moth

Black moth

- 1. Which of these moths would be more likely to survive before the Industrial Revolution? _____

- 2. Which of these moths would be more likely to survive during the Industrial Revolution? _____

- 3. Which of these moths would be more likely to survive after the 1970s? _____

4-6 How have humans changed over time?

Lesson Review

Answer the following.

1. What does *Homo sapien* mean? _____
2. What is anthropology? _____

3. About how old is the humanlike skeleton that Donald Johanson found and named Lucy?

4. About how tall was Lucy? _____
5. List two ways that humans have changed through time. _____

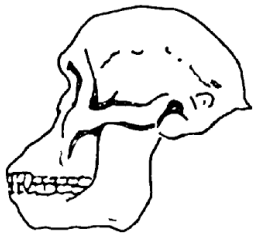
6. Name two types of early humans. _____
7. In what ways were Cro-Magnons more like *homo sapiens* than the Neanderthals? _____

8. What kind of fossil evidence led scientists to say that later humanlike species lived in caves, used fire, and made tools? _____

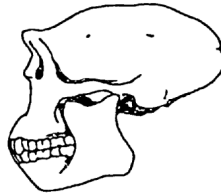
Skill Challenge

Skills: analyzing, applying concepts, sequencing

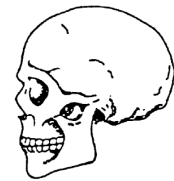
Study the human skulls shown below. Then, use what you learned about how humans have changed through time to place the skulls in order from earliest (A) to most recent (C). Write the correct letter in the space provided.



_____ 1.



_____ 2.



_____ 3.

4. Explain why you placed the skulls in the sequence you did. _____

THE **Big** IDEA

Integrating Earth Science

Chapter 4 What is geologic time?

Lesson Review

Match each term in **Column B** with its description in **Column A**. Write the correct letter in the space provided.

Column A

- _____ 1. record of Earth's history based upon the types of organisms that lived at different times
- _____ 2. large division of geologic time
- _____ 3. age of something compared to the age of something else
- _____ 4. periods are divided into these
- _____ 5. kind of rock in which fossils form
- _____ 6. eras are divided into these

Column B

- a. era
- b. relative age
- c. epochs
- d. periods
- e. sedimentary
- f. geologic time scale

Skill Challenge

Skills: analyzing, inferring, synthesizing

Complete the following.

1. What does the clock on page 113 of your text tell you about geologic time? _____

2. Why do you think coal is called a fossil fuel? _____

3. If you were a geologist far in the future, what ancient artifacts might you find from our time period? What might these objects tell you about life today? _____

Science Log Writing Activity

Complete the Science Log on a separate sheet of paper. To complete the Big Idea Online, go to www.conceptsandchallenges.com. Follow the online instructions.