

SECTION 5-2

SECTION SUMMARY

The Fossil Record

Guide for Reading

- ◆ How do most fossils form?
- ◆ How can scientists determine a fossil's age?

Some of the most important clues to Earth's past are fossils. A **fossil** is the preserved remains or traces of an organism that lived in the past. **Most fossils form when organisms that die become buried in sediments.** Sediments are particles of soil and rock. Layers of sediments build up and cover the dead organism. Over millions of years, the layers harden to become **sedimentary rock**. Some remains that become buried in sediments are actually changed to rock. These fossils are called **petrified fossils**. Sometimes shells or other hard parts buried by sediments are gradually dissolved. A hollow space in sediment in the shape of an organism or part of an organism is called a **mold**. Sometimes a mold becomes filled in with hardened minerals, forming a **cast**. Organisms can also be preserved in ice, tar, or amber.

Scientists can determine a fossil's age in two ways: relative dating and absolute dating. Scientists use **relative dating** to determine which of two fossils is older. In a sequence of rock layers, the layers at the top are younger than the lower layers. Therefore, fossils found in top layers are younger than fossils found in bottom layers. Another technique, called **absolute dating**, allows scientists to determine the actual age of fossils. The rocks that fossils are found near contain **radioactive elements**, unstable elements that decay, or break down, into different elements. The **half-life** of a radioactive element is the time it takes for half of the atoms in a sample to decay. Scientists can compare the amount of a radioactive element in a sample to the amount of the element into which it breaks down to calculate the age of the rock.

The millions of fossils that scientists have collected are called the **fossil record**. Despite gaps in the fossil record, it has given scientists a lot of important information about past life on Earth. Almost all of the species preserved as fossils are now extinct. A species is **extinct** if no members of that species are still alive. Scientists have calculated the ages of many different fossils and rocks. From this information, they have created a "calendar" of Earth's history called the Geologic Time Scale that spans more than 4.6 billion years. The largest length of time in the scale is Precambrian Time. After the Precambrian, the scale is divided into three major blocks called the Paleozoic Era, the Mesozoic Era, and the Cenozoic Era.

According to one theory, called **gradualism**, evolution occurs slowly but steadily. Tiny changes in a species gradually add up to major changes over very long periods of time. According to another theory, called **punctuated equilibria**, species evolve during short periods of rapid change. Species evolve quickly when groups become isolated and adapt to new environments. Most scientists think that evolution can occur gradually at some times and fairly rapidly at others.

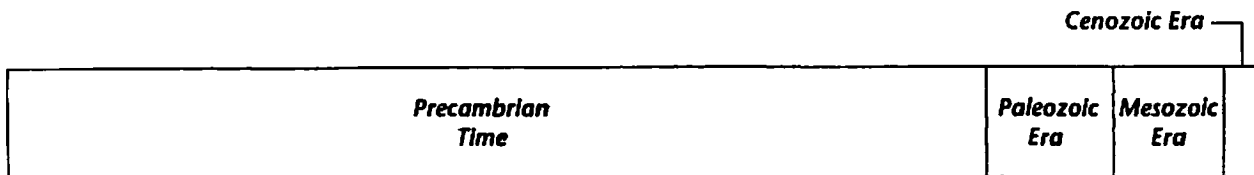
SECTION 5 - 2

REVIEW AND REINFORCE

The Fossil Record

◆ Understanding Main Ideas

Use the figure below to answer questions 1 and 2. Answer all of the following questions on a separate sheet of paper.



1. What is shown in the figure above?
2. What evidence do scientists use to place events on this time line?
3. Describe the process by which most fossils form.
4. Which is older, a fossil in a sedimentary rock layer at the bottom of a canyon or a fossil in a sedimentary rock layer at the top of a canyon? Explain.
5. How do scientists use radioactive elements to determine the actual age of fossils?
6. What is the fossil record, and why is it incomplete?

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

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|---------------------------------|--|
| _____ 7. relative dating | a. a species that has no living members |
| _____ 8. half-life | b. the preserved remains or traces of an organism that lived in the past |
| _____ 9. gradualism | c. the theory that species evolve during short periods of rapid change |
| _____ 10. absolute dating | d. a way to determine the actual age of fossils |
| _____ 11. extinct | e. rock made of hardened sediment |
| _____ 12. sedimentary rock | f. the time it takes for half of a radioactive sample to decay |
| _____ 13. fossil | g. the theory that evolution occurs slowly but steadily |
| _____ 14. punctuated equilibria | h. a way to determine which of two fossils is older |