

# Lesson Outline for Teaching

## Lesson 1: Geologic Time

### A. Evidence That Earth Has Changed

1. Layers of rock provide evidence of Earth's changes.
  - a. Weathering breaks rocks exposed at Earth's surface into smaller pieces called sediment.
  - b. Rock layers form when sediment compresses over time.
  - c. The principle of superposition states that if rock layers have not been folded or deformed, the oldest layers are on the bottom.
2. Other evidence of Earth's past is provided by the preserved remains or evidence of past living organisms, or fossils.
3. Radioactive decay is the process by which one element naturally changes into another element.
  - a. The decay occurs when the nucleus of the atom ejects particles.
  - b. The original element, or parent element, changes into a new element called the daughter element.
  - c. Each radioactive element has a unique half-life, which is the length of time it takes for half of the atoms in a sample of the element to decay.
  - d. By comparing the amount of parent element to the amount of daughter element in a sample, scientists can calculate the age of a sample.

### B. The Geologic Time Scale

1. The geologic time scale is a visual record of Earth's history, with the individual units based on changes in the rocks and fossils.
  - a. The geologic time scale is drawn with the oldest rocks at the bottom and the youngest rocks at the top.
  - b. Scientists divide Earth's history into units of eons, eras, periods, and epochs.
  - c. The divisions in the geologic time scale are not all the same length, but they mark places in the record where there are major changes in the types of fossils present in the rocks.
  - d. The beginning of the Cambrian period is marked by an abrupt appearance of complex life-forms, and the end of the Permian period is marked by a catastrophic die-off of organisms.

## Lesson Outline continued

2. Scientists estimate that Earth is approximately 4.6 billion years old.
  - a. Most changes on Earth, such as the erosion of a mountain range, have occurred slowly.
  - b. Volcanoes and earthquakes can change Earth's surface very quickly (or rapidly).

### Discussion Question

A rock layer from the Triassic period is below a rock layer from the Jurassic period. Based on the law of superposition, what can you conclude about the relative ages of these two periods? How do you think the fossils found in these two rock layers might compare?

Because the rock layer from the Triassic period is below the rock layer from the Jurassic period, it is older and the fossils in the Triassic period are also older. Because these periods are given different names, you might expect the organisms to show different adaptations in each period. In fact, a diverse array of organisms appeared during the Jurassic period, including birds.