**Chapter 9 The History of Life on Earth &**
**Chapter 8 Studying Earth's Past**
**Life Science**

**Name:**
**Period:**
**Date:**

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7.4.d Students know that evidence from geologic layers and radioactive dating indicates that the Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.

~ If you want to know exactly how old a person is, you can ask the person. But how can you find out the age of a rock? Finding the age of an object by determining the number of years the object has existed is called absolute dating. Read on to see how unstable atoms are used in one method of absolute dating.

**Radioactive Decay p.246**

Atoms of the same element that have the same number of protons but have different numbers of neutrons are called isotopes. Most isotopes are stable, meaning that they stay in their original form. But some isotopes are unstable. Scientists call unstable isotopes radioactive. The breakdown of a radioactive isotope into a stable isotope of the same element or another element is called radioactive decay. Figure 1 shows one example of how radioactive decay can happen.

Each kind of unstable isotope decays at a different rate. The rate of radioactive decay for a given isotope can be determined experimentally. For each kind of isotope, the rate of decay is constant. So, certain naturally occurring radioactive isotopes can be used as a kind of "clock" to find the age of rocks that contain these isotopes.

**Figure 1 Radioactive Decay**

When some unstable isotopes decay, a neutron is converted into a proton. In the process, an electron is released.

p.247 **Dating Rocks—Parent and Daughter Isotopes**

An unstable radioactive isotope is called a parent isotope. The stable isotope produced by radioactive decay is called the daughter isotope. Radioactive decay can occur as a single step or a series of steps. In either case, the rate of decay is constant.

To date a rock, scientists compare the amount of parent isotope with the amount of daughter isotope. The more daughter isotope there is, the older the rock is. For this reason, radioactive dating works only on rocks that contained either no daughter isotope or a small amount of daughter isotope at the time the rock formed.

**Radiometric Dating**

If you know the _____ of decay for a radioactive _____ in a rock, you can figure out the _____ age of the rock. Determining the _____ age of a sample based on the _____ of _____ material to _____ material is called _____ dating. For example, let's say that a rock _____ contains an _____ with a ____-life of 10,000 years. A ____-life is the time needed for ____-half of a _____ sample to _____. In this rock sample, after 10,000 years, _____ of the _____ material will have _____ and become _____ material. You _____ the sample and find _____ amounts of _____ material and _____ material. _____ of the _____ radioactive isotope has _____, so the sample must be about _____ years old. Figure 2 shows how this steady _____ happens.

**The Most Useful Rock Samples**

_____ rocks are the _____ types of rock samples to use for _____ dating. When igneous rock _____, _____ are _____ into different _____ in the rock. Thus, when they _____, minerals in _____ rocks often contain only a _____ isotope and _____ of the _____ isotope.