

Absolute Ages of Rocks

Absolute Ages

As you sort through your stack of magazines looking for that article about the car you saw, you decide that you need to restack them into a neat pile. By now, they're in a jumble and no longer in order of their relative age, as shown in **Figure 17**. How can you stack them so the oldest are on the bottom and the newest are on top? Fortunately, magazine dates are printed on the cover. Thus, stacking magazines in order is a simple process. Unfortunately, rocks don't have their ages stamped on them. Or do they? **Absolute age** is the age, in years, of a rock or other object. Geologists determine absolute ages by using properties of the atoms that make up materials.

Radioactive Decay

Atoms consist of a dense central region called the nucleus, which is surrounded by a cloud of negatively charged particles called electrons. The nucleus is made up of protons, which have a positive charge, and neutrons, which have no electric charge. The number of protons determines the identity of the element, and the number of neutrons determines the form of the element, or isotope. For example, every atom with a single proton is a hydrogen atom. Hydrogen atoms can have no neutrons, a single neutron, or two neutrons. This means that there are three isotopes of hydrogen.

What particles make up an atom's nucleus?

Reading Check

Some isotopes are unstable and break down into other isotopes and particles. Sometimes a lot of energy is given off during this process. The process of breaking down is called **radioactive decay**. In the case of hydrogen, atoms with one proton and two neutrons are unstable and tend to break down. Many other elements have stable and unstable isotopes.



Figure 17 The magazines that have been shuffled through no longer illustrate the principle of superposition.

- New Vocabulary**
- absolute age
 - radioactive decay
 - half-life
 - radiometric dating
 - uniformitarianism

- Review Vocabulary**
- isotopes: atoms of the same element that have different numbers of neutrons

Events in Earth's history can be better understood if their absolute ages are known.

Why It's Important

- **Describe** how the half-lives of isotopes are used to determine a rock's age.
- **Identify** how absolute age differs from relative age.

What You'll Learn

as you read