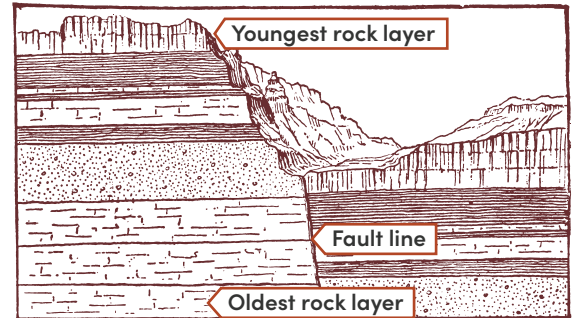


GEOLOGIC TIME SCALE

Read the text, and then answer the questions that follow.

Have you ever wondered how old our planet is? Scientists certainly have! Scientists who specialize in studying Earth's physical structure and history, called **geologists**, estimate that Earth is about 4.6 billion years old. This estimate is based on a thorough analysis of rock layers and the fossil record.

Geologists describe the age of a rock in two ways: relative age and absolute age. The **relative age** of a rock is its age compared to the ages of other rocks. **Absolute age** is the number of years that have passed since the rock formed, and it is calculated through a process called radioactive dating. By studying clues in Earth's rocks and determining their ages, geologists can organize past events into a sequence called the **geologic time scale**.



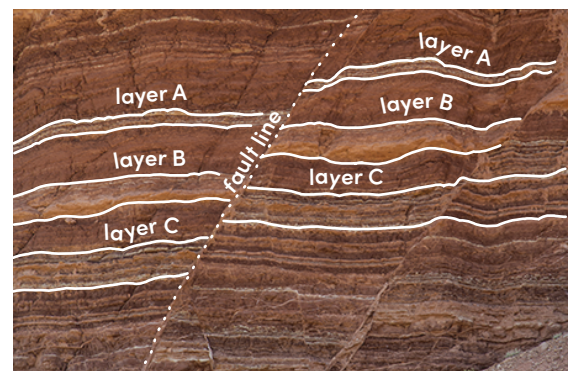
To find a rock's relative age, geologists use a number of different clues:

- The **law of superposition** states that, in undisturbed horizontal sedimentary rock layers, the oldest layer is at the bottom and the youngest layer is at the top.
- Lava that hardens on Earth's surface forms an igneous **extrusion**. An extrusion is younger than the rock it covers.
- Magma that pushes into layers of rock below Earth's surface and hardens forms an igneous **intrusion**. An intrusion is younger than the rock around it.
- A **fault** is a break in Earth's crust caused by forces inside the Earth. A fault is always younger than the rock it cuts through.
- **Index fossils** are fossils of an organism that was widely distributed and existed for a geologically short period of time. Geologists infer that rock layers with matching index fossils are the same age.

Use the information you learned from the passage to answer the questions below.

1. Look at the image to the right. A fault was created in the rock layers during an earthquake. Did the earthquake occur before or after sedimentary rock layers A, B, and C were deposited? Explain. **EXPLANATIONS MAY VARY**

The earthquake occurred after sedimentary rock layers A, B, and C were deposited. The layers had to already be deposited for the fault to be created. A fault is always younger than the rock it cuts through.



2. A geologist finds the same type of index fossil in a rock layer in Kansas and in a rock layer over 7,000 miles away in the Himalayan foothills. What can she infer about the ages of the two rock layers?

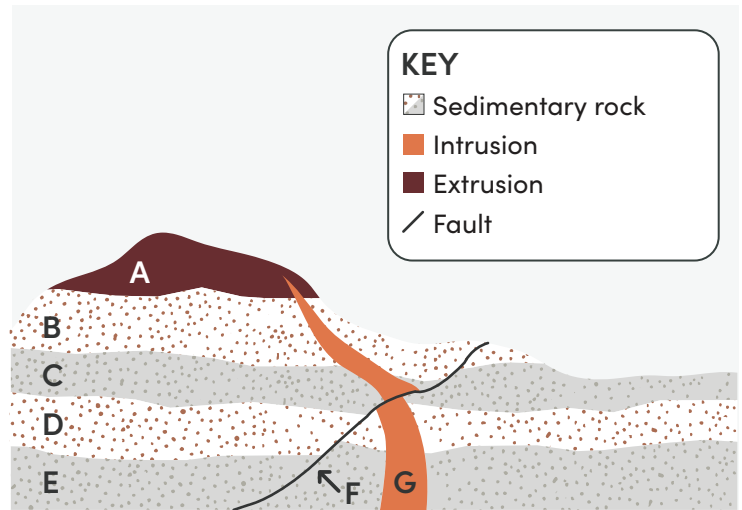
The two rock layers are about the same age.

GEOLOGIC TIME SCALE

Keep going! Answer the questions below. EXPLANATIONS MAY VARY

3. Using the letters shown in the diagram to the right, list the rock layers and formations in order from oldest to youngest. Cite evidence from the diagram to explain your answer.

Order: E, D, C, B, A, G, F. Per the law of superposition, layer E is the oldest sedimentary rock layer and B is the youngest. A is an extrusion, so it's younger than the sedimentary layers below it. G is an intrusion, so it's younger than A-E. F is a fault, so it's younger than all the layers it cuts through.



4. A team of geologists is exploring land around the world that was once covered by ancient seas. They found fossils of marine organisms at three different sites, shown in the diagram to the right.

a. Fossil 3 is a known index fossil. What evidence from sites 1, 2, and 3 supports this?

Fossil 3 is found at all three sites, meaning it was a widely distributed organism. It's only found in one rock layer at each site, meaning it existed for a geologically short period of time.

b. Which rock layers can you infer to be about the same age as layer C? Explain your reasoning.

Layers H and K. These layers all contain the index fossil.

c. Fossils 1 and 2 are the remains of species 1 and 2, respectively. What can you conclude about the relative ages of species 1 and species 2 based on their fossils? Explain your reasoning.

At site 1 and site 2, fossils of species 1 are found in the layers above fossils of species 2. At site 3, a fossil of species 1 is in the same layer as a fossil of species 2. Younger rock layers are deposited on top of older rock layers, according to the law of superposition. So, you can infer that species 1 is younger than species 2.

