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

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Using Radiometric Dating p.248

Figure 3 Half Dome in California's __Yosemite__ National Park formed when a large __mass__ of __magma__ cooled very __slowly__ below Earth's __surface__.

Scientists use different __radiometric__-dating techniques based on the __estimated__ age of a __sample__. The half-__life__ of" an __isotope__ determines how the __isotope__ can be used for __dating__. The __older__ the rock is, the more __daughter__ material there will be __in__ the rock. Isotopes with __long__ half-lives can be used to __date__ old rocks but not __young__ rocks. For __isotopes__ with __long__ half-lives, __younger__ rocks do __not__ contain enough __daughter__ material to __allow__ accurate __measurements__.

Methods of Radiometric Dating

One __isotope__ used for __radiometric__ dating is __potassium__-40. Potassium-40 has a __half__-life of 1.3 __billion__ years. It decays to __argon__ and __calcium__. Geologists measure __argon__ as the __daughter__ material. This __method__ can be used to __date__ rock older than __100,000__ years.

__Uranium__-238 is a radioactive __isotope__ that decays to __lead__-206. The __half__-life of uranium-238 is __4.5__ billion years. Uranium-__238__ dating can be used to date rocks __older__ than 10 __million__ years.

Half Dome, in __Yosemite__ National Park, is shown in Figure 3. This __dome__ is composed of __igneous__ rock. After the rock __formed__, it was __uplifted__ and __shaped__ by __glaciers__. Uranium-lead dating shows that the rock in __Half__ Dome formed about __85__ million years ago. So, geologists can use __relative__ dating to determine that the __uplift__ and glacial __erosion__ happened sometime in the last __85__ million years.

p249 The Age of Our Solar System

Can radiometric __dating__ be used to find the __age__ of Earth? Yes, but __not__ by dating rocks from Earth. The __first__ rocks that __formed__ on Earth have been __recycled__ by plate __tectonics__ and __erosion__. Therefore, there are __no__ Earth rocks __left__ that are as __old__ as our planet. But other __bodies__ in space contain __rock__ that is as __old__ as our __solar__ system.

For example, the __moon__ and some __meteorites__ contain rock that formed as our __solar__ system, including __Earth__, was forming . __Meteorites__ are small, rocky __bodies__ that have __traveled__ through __space__ and __fallen__ to Earth's __surface__. Geologists have found __meteorites__ on Earth. Rocks from the __moon__ have also been __collected__, as shown in Figure 4. __Radiometric__ dating has been __done__ on these __rocks__ from other __parts__ of our solar system. The __absolute__ ages of these __samples__ show that our __solar__ system, including __Earth__, is about __4.6__ billion years __old__.

Figure 4 Scientist-astronaut Harrison __Schmitt__ collects samples of rock on the __moon__ with the lunar __rake__ during the __Apollo__ 17 mission.