ACS Chemistry for Life®

REACTIONS

How old is the Earth?

Thanks to chemistry and some space rocks, we have a pretty good estimate of the Earth's age: about 4.54 billion years old (give or take a few million years).

Radiometric Dating

Scientists can use radiometric dating to determine the age of fossils, rocks, ancient bones and the Earth. Radiometric dating is based on radioactive decay, the process by which atoms of an element (parent atoms) break down, releasing radiation and transforming into a new element (daughter atoms). The term "half-life" marks the time at which half of the parent atoms have turned into daughter atoms. Because this decay happens at a constant rate, scientists can calculate the age of a sample by counting how many parent and daughter atoms are present.

For an atom to be good for determining the Earth's age, both the parent and daughter atoms must be stable enough to persist for billions of years, and must be present in the material you are dating (like ancient rocks, for example). Uranium, which decays through a series of radioactive elements into lead (Pb), is a common choice.

Solar System Snapshot

To understand how old Earth is, scientists needed to turn to space. Our planet is so geologically active that the oldest rocks have probably all been destroyed. Meteorites that fall to Earth are practically unchanged since the time our solar system—and home planet—formed. The oldest meteorites analyzed with radiometric dating are about 4.5 billion years old.

* Before radiometric dating, how did people estimate Earth's age?

Sources:

http://apps.usd.edu/esci/creation/age/content/current_scientific_clocks/lead_isotopes.html

https://geomaps.wr.usgs.gov/parks/gtime/ageofearth.html#age

https://www.washingtonpost.com/news/speaking-of-science/wp/2017/03/06/dear-science-how-do-we-know-how-old-the-earth-is/?utm_term=.1efa84d2c1c4

https://pubs.usgs.gov/gip/geotime/age.html

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