

7.2 Half-life

Certain isotopes of various elements have a known _____ curve. You can use this information to find out _____ a sample is. This is very useful to scientist trying to find out how old a dinosaur fossil or chunk of rock is.

Remember, the _____ is the amount of time it takes for a particular sample of a radioactive isotope to have half the nuclei decay.

Strontium-90 has a half-life of 29 years. If you started with 50g of strontium 90, how much is left after 29 years? _____?

_____ = 25g after 29 years (after 1 half-life)

_____ = 3.125 g after 116 years (4 half-lives)

One of the most useful applications of this is with _____ dating. There is a known ratio of carbon-14 to carbon-12 atoms in living things. Once something dies, there is no more replacement of “fresh” carbon-14. As a result, we can tell how long ago something died by measuring the amount of

_____ left in the sample.

However, there are limits. After about _____ years, most of the carbon-14 has decayed, so this method is only

useful for things _____ years

A _____ is very useful for determining the age using half-life. Unlike most of the examples we use, the age will not be

exactly the time needed for half the sample to decay. But using a graph you can predict with certain accuracy how old something is.

Remember that the original isotope is called the _____ isotope. The end result of the decay process is called the _____ isotope.

Uranium eventually breaks down into _____. Uranium is the _____ isotope, and lead is the _____ isotope.

Ernest Rutherford realized this concept of radioactive decay and used it to try and determine the age of the earth. To do this he needed to choose an isotope with a very long half-life.

_____ was the isotope he used.

When rock is in its liquid form, there is no gas left dissolved in the rock. So when lava cools, the ratio of potassium-40 to its daughter isotope argon-40 is _____

Over time, the potassium-40 breaks down into argon-40.

Argon is a gas and is _____ in the cooled rock in microscopic gas pockets. Now if a scientist were to drill into a sample of rock and measure the ratio of potassium-40 to argon-40 they could tell how old the sample is.

Are there any limitations to this process?