

7.2 Half Life
Science 10 Notes

How Old is It?

Radioactivity plays a key role in determining the ages of very old objects, including rocks, fossils and remnants of ancient civilizations.

One method is to use radio carbon dating

Living organisms take up and metabolize (use) carbon,

including carbon -12 and a very small amount of

radioactive carbon-14.

Once the organism dies, it no longer adds more carbon, and the

carbon-14 begins to decay and turns into nitrogen 14.

By comparing the amount of carbon-14 to nitrogen-14, Scientists can calculate how long the radioactive carbon has been decaying for.

Half Life

- The amount of time required for $\frac{1}{2}$ of a substance to decay

- For any given radioisotope, the half life is a set amount of time.

Example:

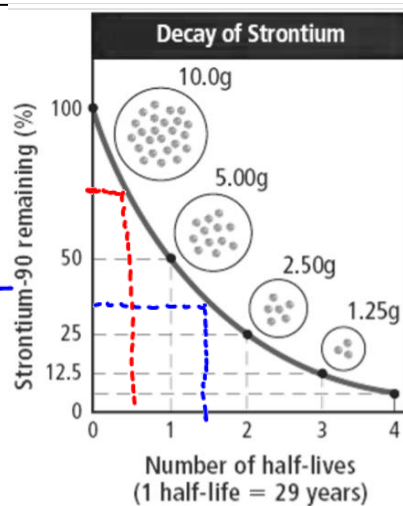
Strontium-90 has a half-life of 29 years. If you have 10g of

Strontium-90 today, then in 29 years, you will have 5g

Radioactive Decay Curves

These show the rate of decay for specific radioisotopes

| time | amount of Strontium 90 |
|------|-------------------------|
| 0 | 10g |
| 29 | 5g ($\frac{1}{2}$) |
| 58 | 2.5g ($\frac{1}{4}$) |
| 87 | 1.25g ($\frac{1}{8}$) |

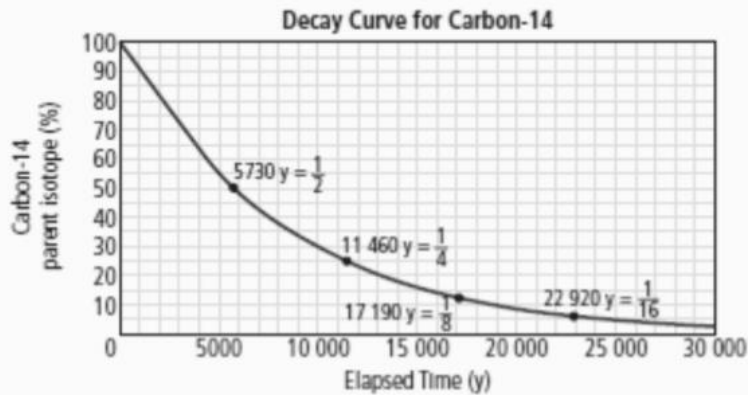


after 1.5 $\frac{1}{2}$ -lives, there is approximately 35% remaining.

if 75% remains, it has been approx .5 $\frac{1}{2}$ -lives

Practice Problems

Try the following half-life problems yourself. Use the decay curve shown below for carbon-14.



1. What is the length of one half-life of carbon-14?
2. How many half-lives have passed when there is $\frac{1}{4}$ of the original amount of carbon-14 remaining?
3. Estimate the percentage of carbon-14 remaining after:
 - (a) 5000 years
 - (b) 10 000 years
 - (c) 20 000 years
4. Estimate the time elapsed when the amount of carbon-14 remaining is:
 - (a) 70 percent
 - (b) 40 percent
 - (c) 5 percent

Answers:

1. 5730 years 2. 2 half lives 3. a) 55%, b) 30%, c) 8% 4. a) 3000 years, b) 7000 years, c) 23000 years

You will be quizzed on these questions next class.