HALF-LIFE

Half-Life

- The amount of time required for half of the radioactive atoms in a sample to decay
  - Strontium-90 has a half-life of 29 years → if 10 g of strontium-90 was started with, there would only be 5 g of strontium-90 after 29 years had passed
- This is a useful tool because it can be used to date things

Carbon Dating

- Uses Carbon-14 to date the remains of organic materials
- Carbon-14 has a half-life of 5730 years
- All organic materials contain the same percentage of carbon-14 (1 in a trillion carbon) atoms → as carbon atoms decay in a living organism, they are constantly replaced so the total number of carbon-14 atoms is almost constant
- When an organism dies, it no longer takes in carbon-14 atoms so the total number starts to decrease
- By measuring the amount of carbon-14 left in a sample, the length of time it has been dead can be determined
- Only useful for samples up to 50 000 years old → after this, there is not enough carbon-14 left to measure

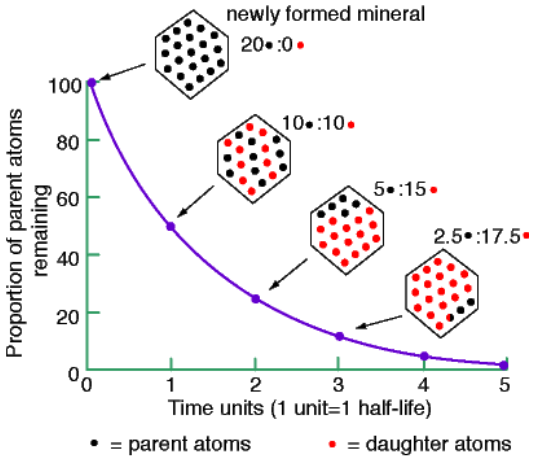
Radioactive Dating

- Other elements with different half-lives can be used to age older samples

Radioactive Element	Half-Life
Radon-222	3.8 days
Potassium-40	1.3 billion years
Uranium-238	4.5 billion years
Rubidium-87	49 billion years

Decay Curve

- A decay curve is a graph that shows the quantity of a radioactive isotope left after a given period of time



- The shape of a decay curve for different radioactive isotopes does not change → only the time frame changes

Half-Life Calculations

- Example: Iodine-131 has a half-life of 8 days. If you started with 50 grams of iodine-131, how much would be left after:
  a. 8 days?

     $8 \div 8 = 1$ → 1 half-life has passed
     50g ÷ 2 = 25g

  b. 32 days?

     $32 \div 8 = 4$ → 4 half-lives
     50g ÷ 2 ÷ 2÷ 2 ÷ 2 = 3.125g

Homework Radioactive Decay Worksheet (BC Science 10 SWB pg. 132)
Calculating Half-Life Worksheet (BC Science 10 SWB pg. 134)
Decay Curves (BC Science 10 SWB pg. 135)