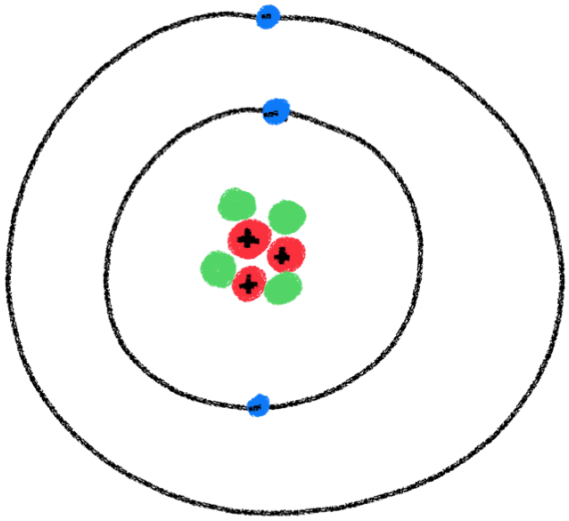
National 5: Nuclear Chemistry



Radioactive decay involves changes in the _____.

Unstable nuclei are called _____.

Radioisotopes decay to become stable.

They do this in three ways:

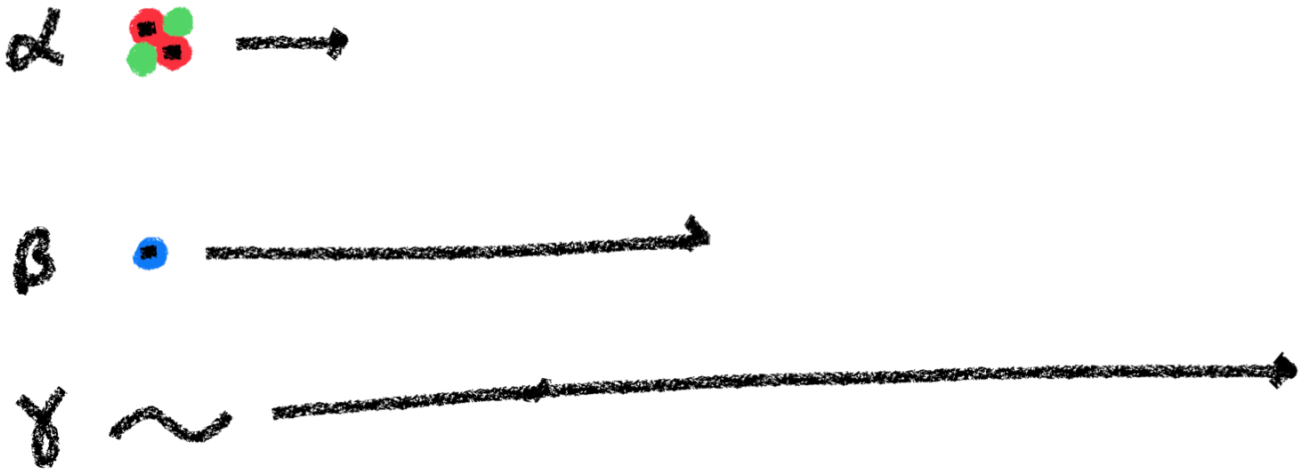
-
-
-

Alpha decay

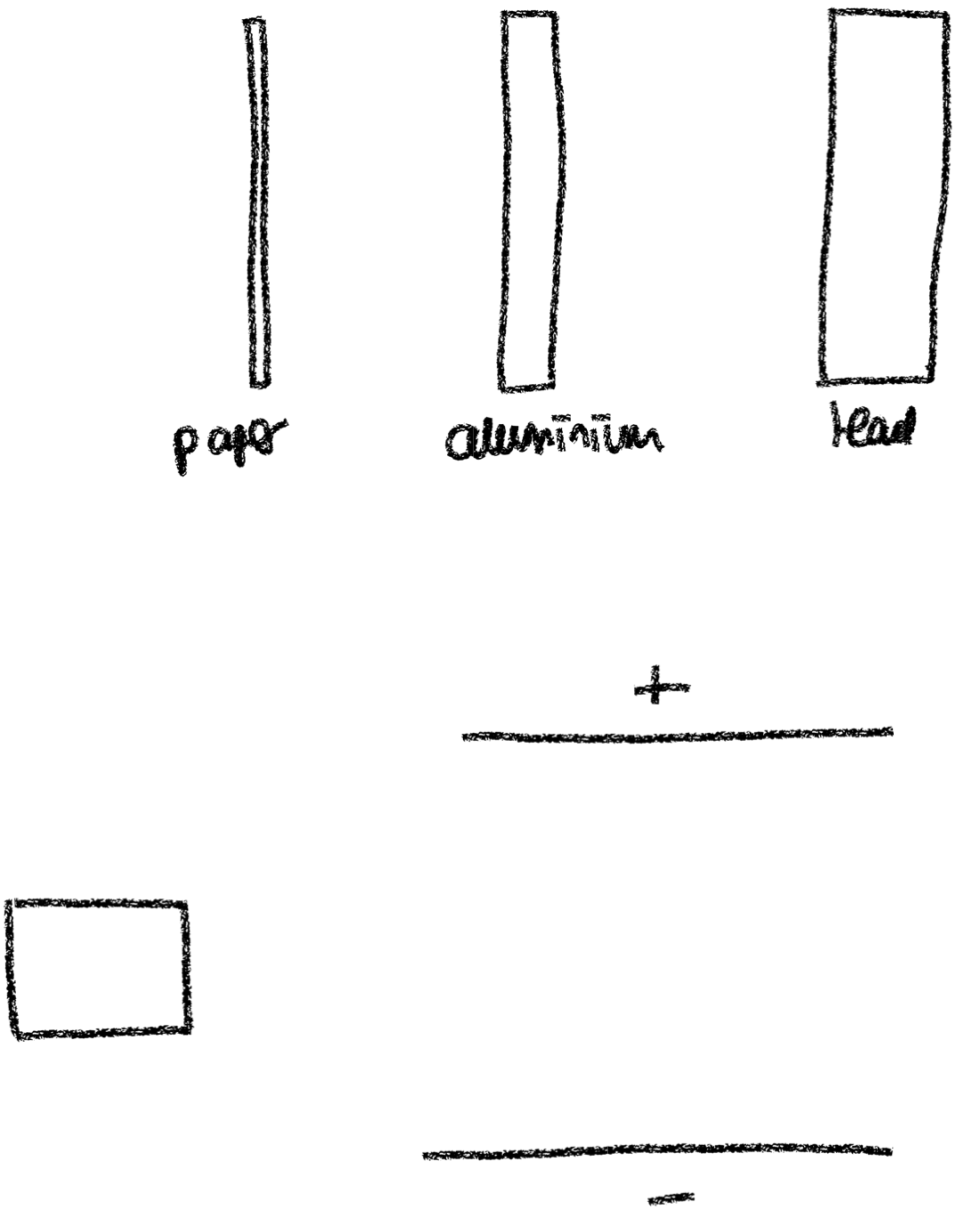
Beta decay

Gamma decay

Distances travelled in air



Blocking radiation



?

Identify the type of radioactive decay being described:

‘Decay in which a neutron breaks into a proton and an electron, the electron is ejected from the nucleus. The radiation can travel around a meter in air but is blocked by a thin sheet of aluminium.’

Representing particles

Alpha

Beta

Proton

Neutron

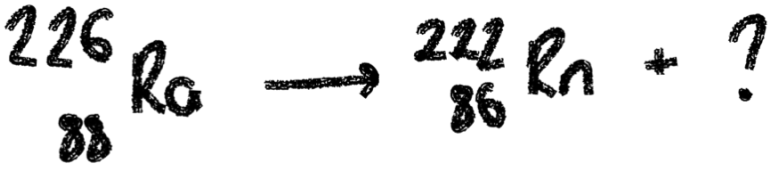
Nuclear equations

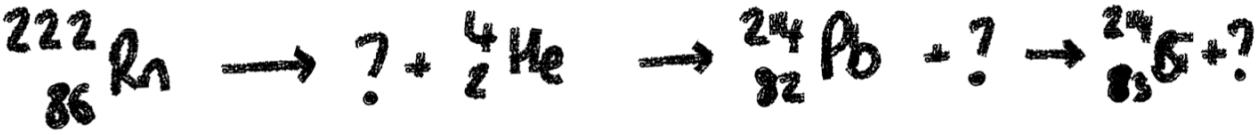
In any nuclear equation the sum of the _____ numbers on the left of the arrow is equal to the same o the _____ numbers on the right.

The sum of the _____ numbers on the left of the arrow is equal to the sum of the _____ number on the right.

?

Complete the decay equations





Half-life

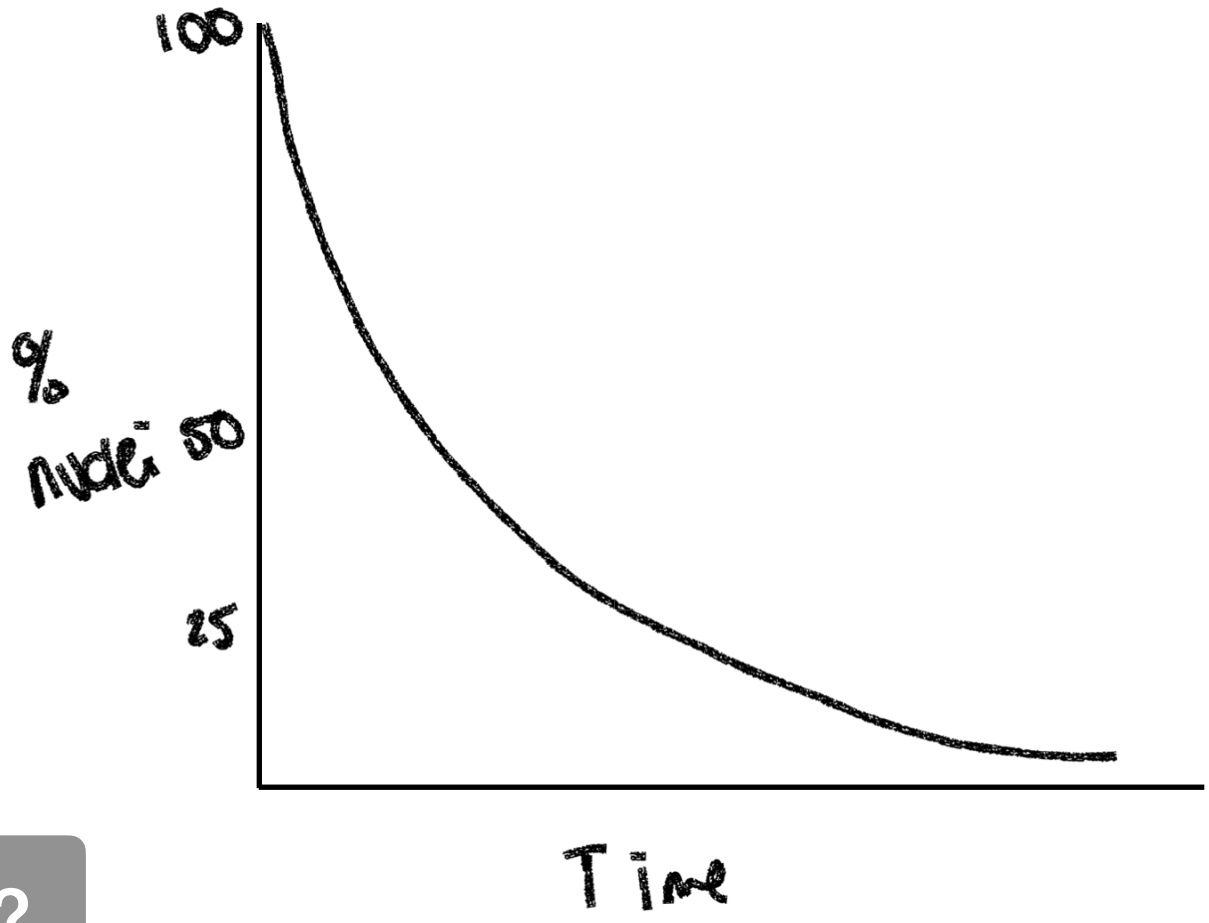
The half-life of a radioisotope is the time it takes for _____ of the _____ to decay.

This value is _____.

It is not affected by by chemical or physical conditions such as _____.

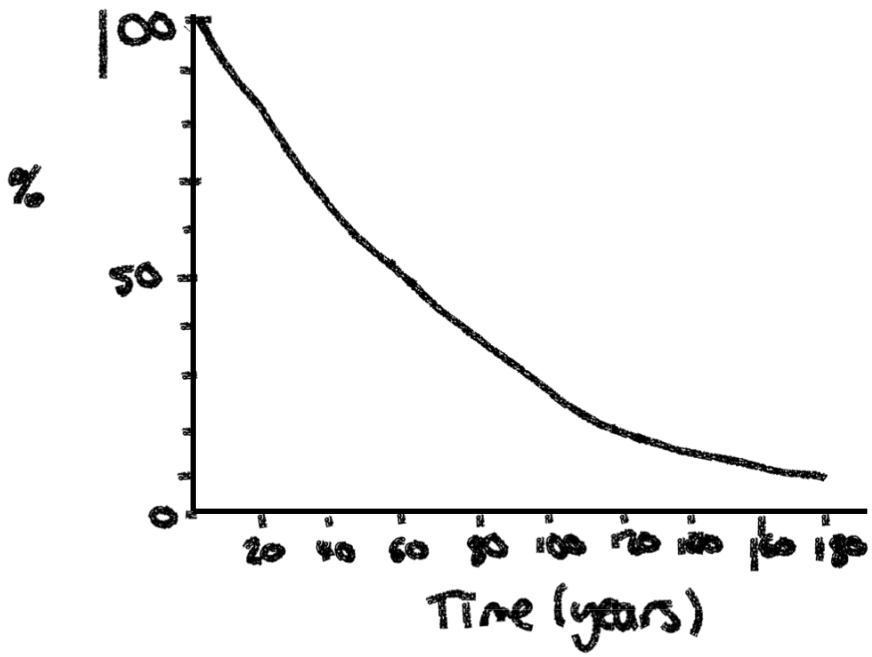
The proportion of radioisotopes present can be used to date objects. Carbon-14 is present in all living organisms at a constant concentration during life. When a living organism dies the carbon-14 starts to decay with a half life of around 5730 years. The proportion of carbon-14 left can be used with the half life to estimate when the living organism died.

Decay



?

Calculate the half life of the radioisotope.



Total time = _____ x _____

Calculate the percentage of radionuclei left after 24 hours for a radioisotope with half life of 6 hours.

Calculate the half life of a radioisotope when 12.5% is left after 300 days.

A radioisotope has a half life of 5200 years. Calculate the total time elapsed if 1/32 of the original radioisotopes are present.

Calculate the fraction of radioisotope that has decayed in 12 minutes for a half lie of 3 minutes.

?

Calculate the half life of a radioisotope that decayed to 25% of its original value in 500 years.

Calculate the total time for decay for a half life for a radioisotope with a half life of 125 seconds to decay to 1/16 of its original value.

Calculate the mass of radioisotope left after 28 years when 600g of radioisotope with half life 4 years decays.

Calculate the percentage of radioisotope with half life 45 seconds that has decayed in 270 seconds.

Uses of radioisotopes

Radioisotopes have many _____ and _____ uses.
When choosing a suitable radioisotope both the _____ of radioactive decay and the _____ must be considered. Medicinal tracers need to be detected outside of the body so _____ would be suitable but they also need to have a short enough half life that they decay in time for the patient to leave hospital. Radioisotopes are used in _____ _____; the decay needs to be stopped by small smoke particles so _____ would be suitable but they need to have a _____ enough half life that the smoke detector can be used for many years.