Science: GCSE Atomic Structure and Radiation

1. Radioactivity Key Words

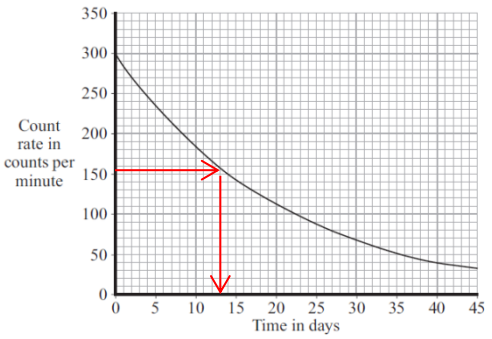
Background radiation	Radiation that is found in the environment such as from rocks, cosmic rays and fallout from nuclear weapons testing.
Becquerel (Bq)	Units for measuring the radioactivity of a source.
Count rate	The speed at which a radioactive source decays (gives out radiation).
Unstable atom	An atom that has a very large nucleus with a high neutron to proton ration meaning that radiation is emitted from the nucleus.
Geiger counter	Instrument used to measure radioactivity of a substance.

2. Types of Radiation

Type of radiation	Symbol	Structure and charge	Range and penetration	Ionising power
Alpha	α	2 protons and 2 neutrons from the nucleus Charge = +2	Travels up to 5cm in air, blocked by paper and skin.	High
Beta	β	Fast moving electron from the nucleus Charge = -1	Most travel up to 15cm in air, blocked by a thin sheet of aluminium.	Medium
Gamma	γ	High energy wave Charge = 0	Can travel at the speed of light so can travel vast distances. Stopped by 1m thick concrete or thick lead plates.	Low

3. Half-Life

The half-life of a radioactive source is the time it takes for the count rate to decrease by half.



1. The starting count rate is 300, so half of that is 150.
2. You find 150 on the y-axis and read across to the line.
3. Then read down from the line to calculate the time.

So for this graph, the half-life is 15 days. This means that every 15 days the count rate will decrease by half.
In 60 days the count rate will be 18.75Bq

4. Half-life Equations (HT)

Alpha decay

When an alpha particle is emitted from the nucleus 2 protons and 2 neutrons are given out. This means the atomic number will decrease by 2 and the atomic mass will decrease by 4.

$$^{235}_{92}U \longrightarrow {}^{231}_{90}Th + {}^{4}_{2}He$$

Beta decay

When a beta particle is emitted from an atom, 1 neutron changes into a proton. This means the atomic number will increase by 1 and the atomic mass will stay the same.

$$^{235}_{92}U \longrightarrow {}^{235}_{93}Np + {}^{0}_{-1}e$$