

5 Radioactivity – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English

Write it 3 times (English)

unstable

radiation

radioactive decay

random

spontaneous

ionising

paper

aluminium

lead

penetrating

half-life

cells

dose

shielding

Recall

From Part 1 you know some nuclei are **unstable** . An unstable nucleus breaks down and gives out **radiation** — this is **radioactive decay** .

- Decay is **random** and **spontaneous** (you cannot speed it up or slow it down).
- There are three types of radiation.

Nothing here is hard — it just compares the three types.

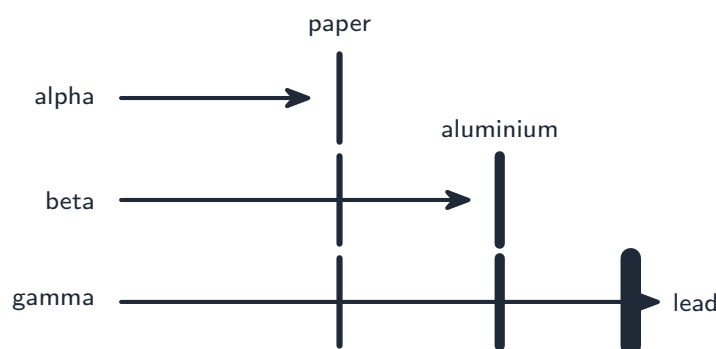
New ideas

Read these first, then do the Practice.

■ 1 Three types of radiation

All three are **ionising** (they knock electrons off atoms):

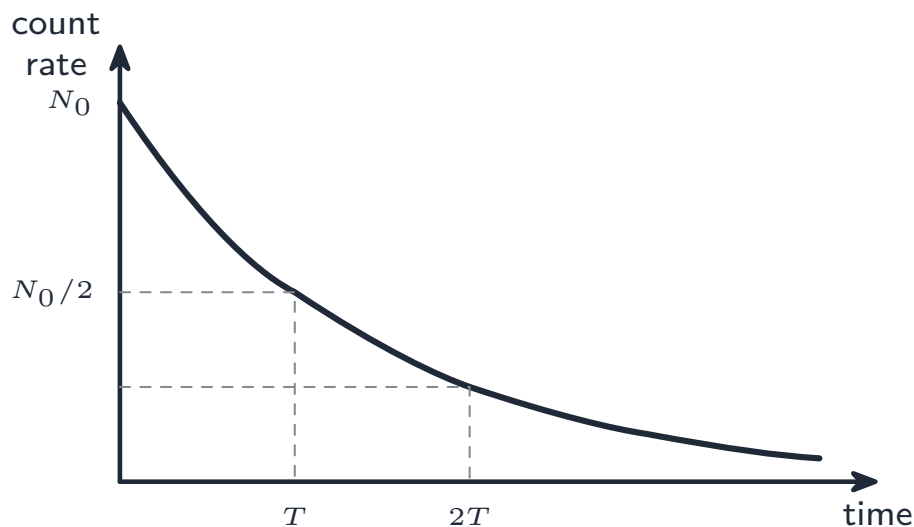
Type	What it is	Stopped by
alpha (α)	a helium nucleus (charge +2)	a sheet of paper
beta (β)	a fast electron (charge -1)	a few mm of aluminium
gamma (γ)	a high-energy wave (no charge)	thick lead (only reduced)



So alpha is the most **ionising** but least **penetrating** ; gamma is the least ionising but most penetrating.

■ 2 Half-life

The **half-life** is the time for **half** the unstable nuclei in a sample to decay. After each half-life the count rate falls to half.



■ 3 Safety

Radiation harms living **cells** . Keep the **dose** low by: **less time** near the source, **more distance**, and **shielding** (such as lead).

Watch out: alpha is the most **ionising** but the *least penetrating*; gamma is the opposite. A half-life **halves** the count rate — after two half-lives the rate is a *quarter*, not zero.

Practice

Try these in order.

5.1 Name the three types of radiation. [3]

5.2 Which type is stopped by a sheet of paper? [1]

5.3 Which type is the most penetrating? [1]

5.4 Define the *half-life* of a radioactive isotope. [1]

5.5 A source has a count rate of 800 counts/min and a half-life of 3 hours. What is the count rate after 6 hours? [2]

5.6 State two ways to reduce the radiation dose you receive. [2]

5.7 Challenge. A sample starts at 1600 counts/min and has a half-life of 2 hours. After how many hours will the count rate fall to 200 counts/min? [3]