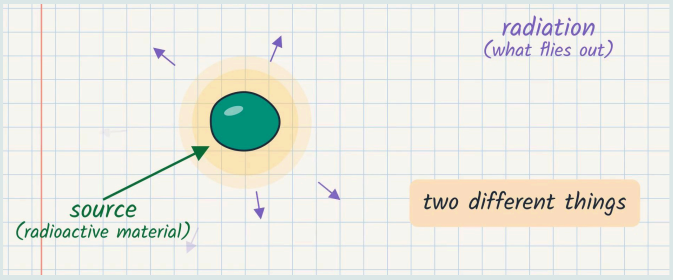
Alpha, beta and gamma

radiation

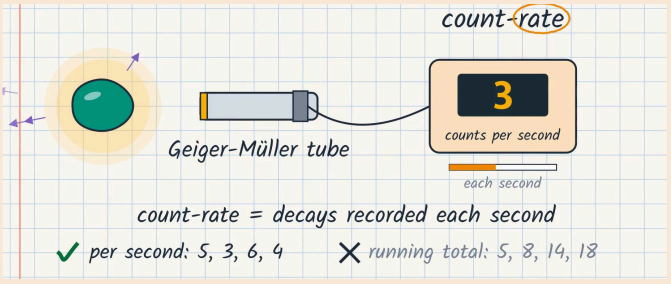
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Summary sheet

1 Why nuclei decay



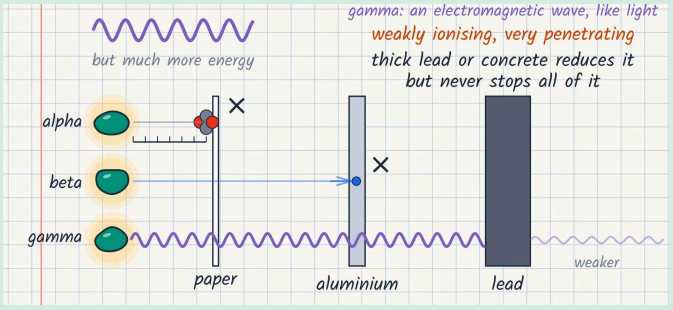
- **Unstable** nuclei give out radiation to become more stable: **radioactive decay**. It is **random**: we can't predict which nucleus decays next, or when.
- The **source** (radioactive material) is not the same thing as the **radiation** that flies out of it.

2 Measuring decay



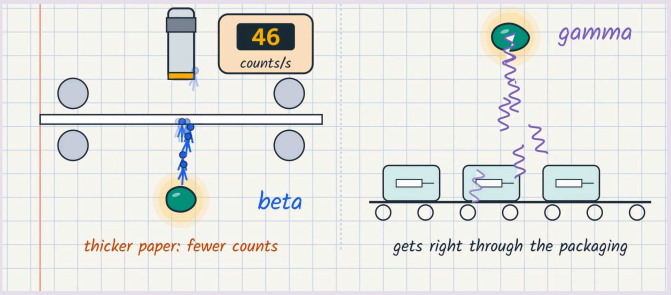
- **Activity** = number of decays per second, measured in **becquerels (Bq)**: 1 Bq = 1 decay per second.
- A detector such as a **Geiger-Müller tube** gives the **count-rate**: decays recorded per second (a rate, not a running total).

3 Alpha, beta and gamma



- **Alpha**: 2 protons + 2 neutrons (a helium nucleus); strongly ionising; a few cm in air; stopped by paper. **Beta**: a fast electron from the nucleus (a neutron turns into a proton); moderately ionising; a few metres in air; stopped by a few mm of aluminium.
- **Gamma**: an electromagnetic wave; weakly ionising, very penetrating; thick lead or concrete reduces it but never stops all of it. Some nuclei also give out a **neutron** (n). The more ionising, the shorter the range.

4 Choosing a source



- **Smoke alarm**: alpha ionises the air so a tiny current flows; smoke blocks the alpha, the current drops and the alarm sounds. It is safe because alpha is stopped by the case and a few cm of air.
- **Paper thickness**: beta (partly gets through, so the count changes with thickness). **Sterilising** medical equipment: gamma (gets right through the packaging).

Exam tip

Asked for a property? Give the property ("stopped by paper", "strongly ionising"), not the name ("alpha"). Use the data in the question.

Check yourself

1. Which type of radiation is an electromagnetic wave?
2. It passes through paper but is stopped by aluminium. Which type?
3. What does one becquerel mean?

Answers: 1. Gamma 2. Beta 3. One decay per second