

7.1 Radioactivity and half-life

Name: _____ Class: _____ Date: _____

Total: 16 marks

Objective

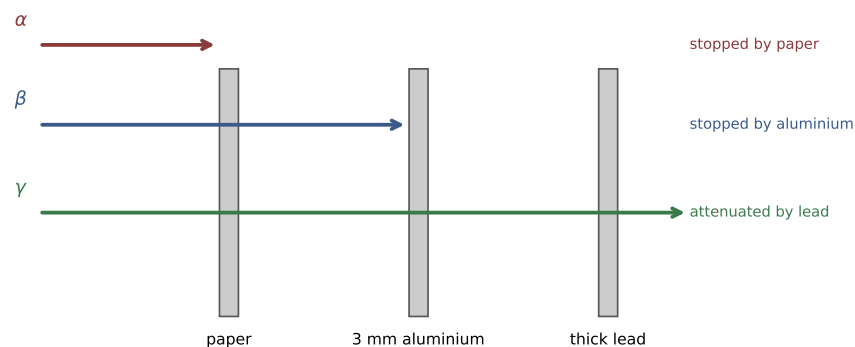
Cover radioactivity (7.2–7.16): nuclear notation, the three radiations with penetration and ionisation, balancing equations, detection, background radiation, half-life and uses, contamination vs irradiation and hazards. Original IGCSE-level practice.

1 Key knowledge and worked examples

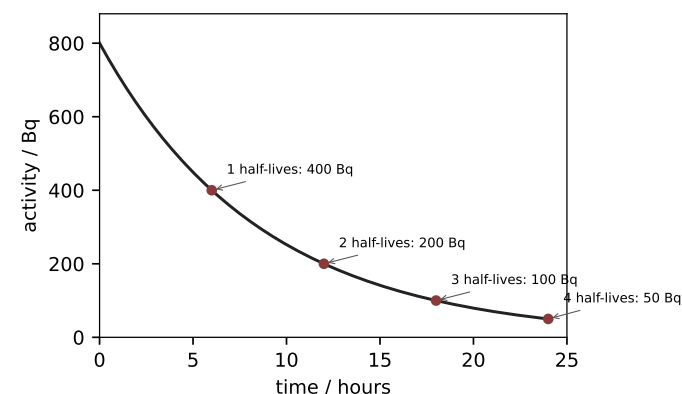
■ Notation and balance

${}^A_ZX$: A = protons + neutrons, Z = protons. Alpha decay loses 4 and 2; beta-minus gains 1 proton, mass unchanged; gamma changes nothing.

Worked check. ${}^{239}_{93}\text{Np} \rightarrow {}^{239}_{94}\text{Pu} + {}^0_{-1}\text{e}$ (beta); ${}^{210}_{84}\text{Po} \rightarrow {}^{206}_{82}\text{Pb} + {}^4_2\text{He}$ (alpha).



■ Halving again and again



3200 Bq, half-life 5 h, after 15 h: $3200 \rightarrow 1600 \rightarrow 800 \rightarrow 400$ Bq.

2 Practice

2.1 In ${}^{31}_{15}\text{P}$, how many protons and neutrons does the nucleus hold? [2]

2.2 Name the radiation stopped by a sheet of paper. [1]

2.3 Which radiation has the longest range in air? [1]

2.4 Give two sources of background radiation. [2]

2.5 Define half-life. [1]

3 Exam-style questions

3.1 Balance the beta decay of $^{90}_{38}\text{Sr}$, writing the daughter nuclide in full notation. [3]

3.2 A source reads 6400 Bq. After 20 days it reads 400 Bq. Determine the half-life. [3]

3.3 Explain why a medical tracer is chosen with a short half-life and gamma emission.[3]
