

Radioactive decay · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Nuclear · 1.1

Reasoning

A detector records counts even when the classroom source is removed. Background must be considered before attributing every count to the source. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Nuclear · 2.1

Reasoning

Radioactive decay is spontaneous and random for an individual nucleus. Half-life describes the time for half the undecayed nuclei in a large population to decay, or for background-corrected activity to halve. half-life: Time for activity or undecayed population to halve; background radiation : Radiation measured apart from the investigated source.

Nuclear · 3.1

Reasoning

Subtract background counts measured over the same time interval. Distinguish irradiation from contamination. Shielding, distance and reduced exposure time can reduce risk under a school-controlled procedure. Use teacher-managed sources and the school radiation rules. Record count duration and repeat background measurements. Do not extrapolate a half-life from one nucleus or from uncorrected readings.

Nuclear · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: measured count rate falls from 100 to 55 counts per minute; background is 10. Source rates are 90 and 45, so one half-life has elapsed. Without subtraction, $55/100$ would obscure the exact half in this example.

Nuclear · 4.2

Reasoning

An initial source count is 160 per minute. Find it after three half-lives. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Nuclear · 5.1

Reasoning

An irradiated object is not automatically radioactive. A half-life does not predict the exact decay time of one nucleus. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Nuclear · 5.2

Reasoning

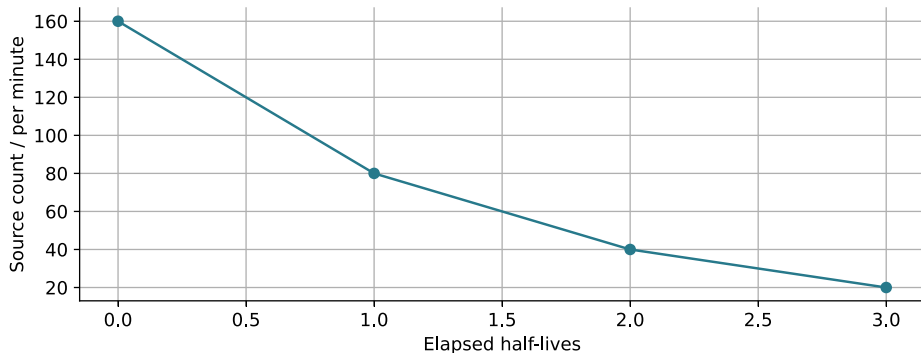
Half-life predicts the exact decay time of an individual nucleus. This claim is false: An irradiated object is not automatically radioactive. A half-life does not predict the exact decay time of one nucleus.

Nuclear · 5.3

Reasoning

Nuclear changes and radiation evidence: Subtract background counts measured over the same time interval. Distinguish irradiation from contamination. Shielding, distance and reduced exposure time can reduce risk under a school-controlled procedure.

Nuclear · diagram



- Original teaching diagram: Nuclear changes and radiation evidence
- Use the labels and the stated model together.

Nuclear · original transfer

Your turn

A fictional counter reads 90 counts/min, then 50 after one half-life. Background is constant. Infer background and initial source rate.

Nuclear · transfer reasoning

Method and interpretation

$90 - b = 2(50 - b)$, so $b = 10$ counts/min. Source rates are 80 then 40. Background does not decay with the source and must be subtracted; counting uncertainty remains.

Check yourself

- Explain half-life using the stated model.
- Explain background radiation using the stated model.
- Change one value in the original transfer; explain which assumption still matters.