Radioactivity: evidence and explanation review

Student activity • observation and reasoning

YEAR 11 / LESSON 100 / PHYSICS + SCIENCE (DOUBLE AWARD)

The question

Can you link a calculation or radiation choice to the right physical explanation?

Use original review questions to connect nuclear changes with evidence and practical limitations.

Equipment

- Booklet, ruler and calculator

Desk-based review only. No sources, detectors or exposure demonstrations are needed.

Course coverage: Shared Physics / Double Award: Review of 7.2–7.16: nuclear structure, decay, detection, half-life and applications.

Plan, model or apparatus sketch

Draw a labelled graph, nuclear diagram or application model appropriate to the question.

Method and reasoning

Read the whole sequence before starting

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1. For a neutral atom with A = 23 and Z = 11, state proton, neutron and electron numbers. Explain which number identifies the element.

2. Compare alpha, beta-minus and gamma by nature, charge and typical penetration. Include the limits of simplified penetration rankings.

3. Balance an alpha emission from A = 238, Z = 92 and a beta-minus emission from A = 14, Z = 6 using A and Z sums.

4. Use a practice raw count rate of 90 counts per minute and background 10 to calculate corrected rate. If that corrected rate halves every 3 minutes, predict corrected and raw rates after 6 minutes.

5. Distinguish contamination from irradiation in one industrial or medical application. Explain why detector count rate is not automatically source activity.

6. Check the guidance and rewrite one calculation with units plus one explanation with a stated limitation. Keep invented examples separate from earlier measured background counts.

Cleanup

- Retain corrected work for revision.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Original review data only. The corrected rate is 80 counts min^{-1} initially, 20 after two half-lives; raw rate after 6 minutes is 30 counts min^{-1}. No physical source is used.

Topic	Initial answer	Correction / reason
Nuclear structure		
Radiation types		
Nuclear equations		
Counts and half-life		
Applications		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Find particle counts for the neutral atom.

2. What is beta-minus radiation?

3. Find the alpha daughter A and Z.

4. Find the beta-minus daughter A and Z.

5. Find corrected and raw rates at 6 minutes.

6. Why distinguish contamination from irradiation?