A Level · OCR · Physics

4 mins 4 questions

Multiple Choice Questions

Radioactivity

Radioactive Decay / Alpha, Beta & Gamma Radiation / Alpha & Beta Decay Equations / Activity & The Decay Constant / Half-Life / Radioactive Decay Equations / Modelling Radioactive Decay / Radioactive Dating

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Total Marks /4

1 A student is modelling the decay of a radioactive source using the equation $\Delta N / \Delta t = -0.5$ N.
The student decides to use $\Delta t = 0.10$ s.
The number N of radioactive nuclei is 2000 at $t = 0$.

Part of the modelling spreadsheet from the student is shown below.

t / s	Number N of radioactive nuclei remaining at time t	Number of nuclei decaying in the next 0.10 s
0	2000	100
0.10	1900	
0.20		
0.30		

What is the value of N at $t = 0.30$ s?

A. 1700

B. 1710

C. 1715

D. 1805

(1 mark)

2 A radiation detector is placed in front of a beta-emitting source. The count-rate is measured and recorded every 10 minutes. The results are shown below.

311 s^{-1}	309 s^{-1}	299 s^{-1}	307 s^{-1}	321 s^{-1}

What term can be used to describe the data shown?

A. exponential

B. linear

C. random

D. spontaneous

(1 mark)

3 The nucleus of thorium-232 $\left({}^{232}_{90}\mathrm{Th}\right)$ emits two alpha particles and two beta-minus particles to become a nucleus of an isotope of radium.

What is the nucleon number *A* and the proton number *Z* for the nucleus of this radium isotope?

A. $A = 224$, $Z = 88$

B. $A = 228$, $Z = 86$

C. $A = 224$, $Z = 84$

D. $A = 228$, $Z = 88$

(1 mark)

4 A sample of plutonium-210 has 4.0×10^{10} nuclei.

Given that the initial activity of the sample is 2.3×10^{3} Bq, what is the half-life of plutonium-210?

A. 40 ns

B. 3300 days

C. 1.2 s

D. 140 days

(1 mark)