



QUESTION WORKBOOK

Radioactive decay and half-life

Nuclear physics · Year 13

AQA 3.8.1.3, 3.8.1.4 · CIE 11.1, 23.2 · OCR A 6.4.3

10 questions · 30 marks

PRINT EDITION

SECTION A · Warm-up

A1 Define the half-life of a radioactive isotope. [2]

A2 A sample contains 1.0×10^{20} undecayed nuclei with a decay constant of 0.02 s^{-1} . Calculate the activity, using $A = \lambda N$. [2]

A3 State the relationship between half-life and decay constant. [2]

SECTION B · Standard

B1 An isotope has a half-life of 6.0 hours. Calculate its decay constant in hours^{-1} . [3]

- B2** A sample starts with 8.0×10^{20} undecayed nuclei and has a half-life of 5.0 days. Calculate the number remaining after 15 days. [4]

- B3** A source has an initial activity of 400 Bq. Calculate its activity after two half-lives. [3]

- B4** A sample of 5.0×10^{18} nuclei has a half-life of 8.0 s. Calculate its activity. [3]

SECTION C · Stretch

- C1** A source has an initial activity of 600 Bq and a half-life of 10 hours. Calculate its activity after 25 hours, using $A = A_0 e^{-\lambda t}$. [4]

- C2** The activity of a source falls from 800 Bq to 50 Bq. Given a half-life of 3.0 days, calculate the time taken. [4]

- C3** A nuclide lies above the line of stability, having too many neutrons for its number of protons. Predict its likely mode of decay and explain your reasoning. [3]