InkPhysics

QUESTION WORKBOOK

Stable and unstable nuclei

Particles · Year 12

AQA 3.2.1.2 · CIE 11.1 · OCR A 6.4.1, 6.4.3

10 questions · 31 marks

NAVY SCREEN EDITION

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SECTION A · Warm-up

A1 Describe the strong nuclear force, including its approximate range and whether it is attractive or repulsive. [2]

A2 State how the mass number A and the proton number Z change when a nucleus emits an alpha particle. [2]

A3 State what a beta-minus particle is. [2]

SECTION B · Standard

B1 Uranium-238 decays by alpha emission to thorium (Th). Write the balanced nuclear equation, including mass and proton numbers. [4]

B2 Carbon-14 decays by beta-minus emission to nitrogen (N). Write the balanced nuclear equation, including the antineutrino. [4]

B3 Explain why the existence of the (anti)neutrino was proposed to account for observations of beta-minus decay. [3]

B4 In an unknown decay, the proton number increases by 1 while the mass number stays the same. State the type of decay and explain your reasoning. [3]

SECTION C · Stretch

C1 Radium-226 decays by alpha emission to radon (Rn). Write the balanced nuclear equation and state the number of neutrons in the radon nucleus produced. [4]

C2 Describe how the strong nuclear force between two nucleons varies with their separation, referring to the separations at which it is repulsive, attractive and effectively zero. [4]

C3 Explain why very large nuclei tend to be unstable. [3]