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QUESTION WORKBOOK

Rutherford scattering and the nuclear atom

Nuclear physics · Year 13

AQA 3.8.1.1, 3.8.1.2 · CIE 11.1 · OCR A 6.4.1, 6.4.3

10 questions · 30 marks

NAVY SCREEN EDITION

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SECTION A · Warm-up

A1 Describe the main observations of the alpha-particle scattering experiment. [2]

A2 State the conclusions about atomic structure drawn from these observations. [2]

A3 State a material that stops each of alpha, beta and gamma radiation. [2]

SECTION B · Standard

B1 A radiation is stopped by paper. A second is stopped by a few millimetres of aluminium but passes through paper. A third passes through both but is reduced by lead. Identify each radiation. [3]

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B2 A gamma source gives an intensity of 800 (arbitrary units) at 1.0 m. Assuming an inverse-square law, calculate the intensity at 2.0 m. [3]

B3 A gamma detector reads 1600 counts per second at 0.50 m from a source. Assuming an inverse-square law, calculate the reading at 2.0 m. [4]

B4 Explain why the great majority of alpha particles pass through the gold foil almost undeflected. [3]

SECTION C · Stretch

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C1 With a gamma source, the count rate at 0.10 m is 520 counts per second, which includes a background of 20 counts per second. Using the inverse-square law for the corrected count, predict the measured count rate at 0.20 m. [4]

C2 Explain why a few alpha particles were deflected through very large angles, and which particles are deflected the most. [4]

C3 Compare the ionising power and penetration of alpha, beta and gamma radiation. [3]

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