GET BETTER AT PHYSICS · MARK SCHEME

Rutherford Scattering: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.8.1.1 · 5 questions · 5 marks

1 mark per correct letter | Worked reasoning for every question | **How students did** = from AQA examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
C	C	C	A	C

Easy

Questions 1–2

1 **C**

What is not true about alpha scattering · AQA June 2023 · A-level Paper 2 · Q26

Most alpha particles pass straight through the foil, and only a very small number bounce back. So C is not true. A, B and D are all correct features of the experiment.

> **Watch out:** This asks for the statement that is **not** true.

How students did: At least 70% of students got this right in June 2023.

2 **C**

What Rutherford scattering led to · AQA June 2017 · A-level Paper 2 · Q26

The large-angle deflections showed that atoms have a small, dense, positively charged nucleus. Rutherford scattering led to the discovery of the nucleus.

> **Watch out:** The electron was discovered earlier (by J. J. Thomson), and wave–particle duality comes from electron diffraction.

Medium

Questions 3–5

3 **C**

What was observed in the experiment · AQA June 2022 · A-level Paper 2 · Q25

Some alpha particles were deflected through angles greater than 90°, which was the key observation. Most were not reversed (D is wrong); they passed straight through.

> **Watch out:** 'Alpha particles are helium nuclei' (B) is true, but it was not deduced from this experiment.

How students did: Fewer than 40% of students got this right in June 2022.

4 **A**

What scattering tells us about nuclear size · AQA June 2024 · A-level Paper 2 · Q29

An alpha particle's closest approach to a gold nucleus is about 10^{-14} m, and it never reaches the nucleus. So the experiment only shows that the radius is smaller than this: $r < 10^{-14}$ m.

> **Watch out:** Alpha scattering gives an upper limit, not an exact value. Electron diffraction is used to measure the radius.

How students did: Fewer than 35% of students got this right in June 2024, and the correct answer was not the most popular choice.

5 **C**

Closest approach to a gold nucleus · AQA June 2023 · A-level Paper 2 · Q19

All the kinetic energy becomes electric potential energy: $E_k = (79e)(2e) / (4\pi\varepsilon_0 r)$. $r = 8.99 \times 10^9 \times 79 \times 2 \times (1.60 \times 10^{-19})^2 \div 9.0 \times 10^{-13} = 4.0 \times 10^{-14}$ m.

> **Watch out:** Use charge 2e for the alpha particle and 79e for the gold nucleus. Using e for the alpha particle gives 2.0×10^{-14} m (B).

End of mark scheme. Answers from AQA's published keys; explanations written for this pack. AQA material is © AQA. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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