FREE REVISION PACK

Rutherford Scattering

AQA A-level Physics · 7408 · Specification 3.8.1.1

Easy | Medium | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	What is not true about alpha scattering	AQA June 2023 · A-level Paper 2 · Q26	1 mark
2	Easy	What Rutherford scattering led to	AQA June 2017 · A-level Paper 2 · Q26	1 mark
3	Medium	What was observed in the experiment	AQA June 2022 · A-level Paper 2 · Q25	1 mark
4	Medium	What scattering tells us about nuclear size	AQA June 2024 · A-level Paper 2 · Q29	1 mark
5	Medium	Closest approach to a gold nucleus	AQA June 2023 · A-level Paper 2 · Q19	1 mark

Key ideas to have ready

- Most alpha particles pass straight through gold foil, so most of an atom is empty space.
- A few are deflected through large angles (more than 90°), so the positive charge and most of the mass are concentrated in a tiny nucleus.
- Closest approach of a head-on alpha particle: $E_k = Q_{nucleus}q_\alpha / (4\pi\varepsilon_0 r)$. It gives an upper limit for the nuclear radius (about 10^{-14} m).
- At the closest point, the speed and kinetic energy are smallest and the electric potential energy, force and acceleration are largest.

How to use this pack

1. The questions are grouped into levels (Easy and Medium). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in AQA's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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Easy

Definitions and one-step ideas. Most students get these right.

Questions 1–2

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2023 · A-level Paper 2 · Q26

1 Alpha particle scattering can be demonstrated using a thin gold foil.

Which statement about this demonstration is **not** true?

[1 mark]

A The foil is thin enough to assume that alpha particles are deflected only once. ⬭

B Nuclei are more massive than alpha particles which allows the alpha particles to be deflected by more than $90°$. ⬭

C The number of alpha particles deflected backwards is greater than the number that pass straight through the foil. ⬭

D Deflections of alpha particles by electrons in the foil are much smaller than deflections due to nuclei. ⬭

AQA June 2017 · A-level Paper 2 · Q26

2 The Rutherford scattering experiment led to

[1 mark]

A the discovery of the electron. ⬭

B the quark model of hadrons. ⬭

C the discovery of the nucleus. ⬭

D evidence for wave-particle duality. ⬭

Medium

Two or three steps. Roughly a third to a half of students get these right.

Questions 3–5

AQA June 2022 · A-level Paper 2 · Q25

3 What was deduced or observed in the Rutherford scattering experiment?

[1 mark]

A All gold atoms are not alike. ⬭

B Alpha particles are helium nuclei. ⬭

C Some particles were deflected through angles greater than $90°$. ⬭

D The motion of most alpha particles was reversed. ⬭

AQA June 2024 · A-level Paper 2 · Q29

4 What can be deduced about the radius r of a nucleus of gold from the scattering of alpha particles by gold nuclei?

[1 mark]

A $r < 10^{-14}$ m ⬭

B $r < 10^{-15}$ m ⬭

C $r \approx 10^{-15}$ m ⬭

D $r \approx 10^{-16}$ m ⬭

AQA June 2023 · A-level Paper 2 · Q19

5 An alpha particle is moving towards a stationary gold nucleus. The alpha particle has a kinetic energy of 9.0×10^{-13} J when it is a large distance from the gold nucleus.
The gold nucleus contains 79 protons.

What is the closest possible distance of approach of the alpha particle to the gold nucleus?

[1 mark]

A 2.5×10^{-16} m ⬭

B 2.0×10^{-14} m ⬭

C 4.0×10^{-14} m ⬭

D 2.0×10^{-7} m ⬭

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition:
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