GET BETTER AT PHYSICS · MARK SCHEME

Charged Particles in Magnetic Fields: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.7.5.2 · 4 questions · 4 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
A	C	B	D

Easy

Question 1

1 **A**

Radius with half the speed and four times the field · AQA June 2019 · A-level Paper 2 · Q13

r = mv / (Be). Halving v halves r, and four times B divides r by 4. New radius = R × ½ × ¼ = R/8.

Watch out: 2R (C) and 8R (D) put B or v on the wrong side: a stronger field bends the electron into a tighter circle.

How students did: In June 2019 this was answered about as well as the rest of Section B.

Medium

Questions 2–4

2 **C**

Speed after two different fields · AQA June 2018 · A-level Paper 2 · Q26

The magnetic force is always at right angles to the velocity, so it does no work on the particle. Its speed never changes: it leaves the second chamber at 80 m s^{-1}.

Watch out: The smaller radius comes from a stronger field in the second chamber, not from a change of speed (A, B, D).

How students did: 34.8% of students got this right in June 2018.

3 **B**

Two isotopes in the same field · AQA June 2023 · A-level Paper 2 · Q21

The ions have the same charge and speed, so the force BQv is the same for both (A is wrong). The isotopes have different masses, so r = mv / (BQ) is different: B is true. The force does no work, so the kinetic energy stays the same (C is wrong), and a = F / m is different for the two masses (D is wrong).

Watch out: Same force, different mass: different acceleration and different radius.

4 **D**

Circuits per second in a magnetic field · AQA June 2024 · A-level Paper 2 · Q16

r = m_ev / (Be), so the time for one circuit is T = 2πr / v = 2πm_e / (Be). Circuits per second = 1/T = Be / (2πm_e).

Watch out: A is the time for one circuit, not the number per second; B is also T. C would need a 2 in the bottom: v / (2πr).

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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