GET BETTER AT PHYSICS · MARK SCHEME

Charged Particles in Magnetic Fields: tiered multiple choice

Edexcel IAL Physics · Unit 4 (WPH14) · Specification points 106, 115 · 5 questions · 5 marks

1 mark per correct letter

Worked reasoning for every question

How students did = from Pearson examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
C	A	B	D	D

Easy

Questions 1–4

1 **C**

Speed of a proton from the magnetic force · Edexcel IAL January 2024 · Unit 4 · Q3

F = Bqv, so v = F/(Bq). B = 45 mT = 45 × 10^{-3} T and q = 1.6 × 10^{-19} C: v = 1.35 × 10^{-13} ÷ (45 × 10^{-3} × 1.6 × 10^{-19}).

Watch out: Convert mT to T, and use the proton's charge (not its mass, 1.66 × 10^{-27} kg).

How students did: 92% of students got this right in January 2024.

2 **A**

Why a proton's circular path gets smaller · Edexcel IAL June 2024 · Unit 4 · Q9

r = p/(Bq) = mv/(Bq). If the proton loses kinetic energy (for example by ionising the material it passes through), its speed and momentum fall, so the radius decreases.

How students did: 82% of students got this right in June 2024.

3 **B**

Comparing two particles from their paths · Edexcel IAL October 2023 · Unit 4 · Q7

r = mv/(Bq), and both particles have the same speed in the same field, so r ∝ m/q. Y moves in a much smaller circle than X, so Y has a smaller m/q: less mass and greater charge (row B) does this.

How students did: 65% of students got this right in October 2023.

4 **D**

Identifying a particle from its spiral track · Edexcel IAL January 2023 · Unit 4 · Q4

A spiral track shows the particle slowing down (losing energy), so its radius gets smaller: it moves from the outer end Y to the inner end X. With the field into the page, the direction of curvature from Y to X then fits a negatively charged particle: an electron.

How students did: 52% of students got this right in January 2023.

Hard

Question 5

5 **D**

Electron moving at an angle to a magnetic field · Edexcel IAL October 2024 · Unit 4 · Q5

F = Bqv sin θ, where θ is the angle between v and B. The velocity is horizontal and B is 24° from the vertical, so θ = 90° − 24° = 66°. So v = F/(B × e × sin 66°). For the direction, use Fleming's left-hand rule, remembering that conventional current is opposite to the electron's motion: the force into the page means the electron moves from Y to X.

> **Watch out:** Two traps: the angle needed is between v and B (66°), and an electron's 'current' is opposite to its velocity.

How students did: 28% of students got this right in October 2024.

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

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