GET BETTER AT PHYSICS · MARK SCHEME

Collisions & Momentum in 2D: tiered multiple choice

Edexcel IAL Physics · Unit 4 (WPH14) · Specification points 83–86 · 6 questions · 6 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	Q6
D	B	D	C	B	B

Easy

Questions 1–3

1 **D**

Momentum from kinetic energy · Edexcel IAL October 2024 · Unit 4 · Q6

$E_k = p^2/(2m)$, so $p = \sqrt{(2mE_k)} = \sqrt{(2 \times 9.11 \times 10^{-31} \times 3.5 \times 10^{-28})}$.

How students did: 90% of students got this right in October 2024.

2 **B**

Inelastic collision of trolleys · Edexcel IAL October 2024 · Unit 4 · Q7

With negligible friction there is no external force, so total momentum is conserved in every collision. The trolleys stick together, so the collision is inelastic: some kinetic energy is transferred to other stores (heat, sound), and total kinetic energy is not conserved.

How students did: 86% of students got this right in October 2024.

3 **D**

Momentum vector diagram for a decay · Edexcel IAL June 2024 · Unit 4 · Q2

Momentum is conserved, so the momentum of P before equals the vector sum of the momenta of Q and R after: $p_P = p_Q + p_R$. Drawn head to tail, Q and R make two sides of a triangle and P is the resultant from the start of the first to the end of the second. Only D has the arrows arranged this way.

How students did: 67% of students got this right in June 2024.

Medium

Questions 4–6

4 **C**

Ratio of momenta for equal kinetic energies · Edexcel IAL June 2025 · Unit 4 · Q9

$p = \sqrt{(2mE_k)}$. S and T have the same E_k, and T has twice the mass, so $p_T/p_S = \sqrt{(2m/m)} = \sqrt{2}$.

5 **B**

Speed after a glancing elastic collision · Edexcel IAL June 2021 · Unit 4 · Q7

In an elastic collision kinetic energy is conserved: $\frac{1}{2}mv^2 = \frac{1}{2}mu^2 + \frac{1}{2}mu^2$, so $u^2 = v^2/2$ and $u = v/\sqrt{2}$. (Momentum conservation then shows each sphere moves off at 45°.)

Watch out: Use the fact that the collision is elastic: kinetic energy, not just momentum, is conserved.

6 **B**

Momentum gained by a proton and an alpha particle · Edexcel IAL October 2025 · Unit 4 (alternative paper) · Q8

Starting from rest, $\Delta p = p = \sqrt{(2mE_k)}$. The alpha particle has 4 times the mass of the proton and gains the same kinetic energy, so its momentum change is $\sqrt{4} = 2$ times as big: $2\Delta p$.

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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