FREE REVISION PACK

Collisions & Momentum in 2D

Pearson Edexcel International Advanced Level Physics · Unit 4 (WPH14) · Specification points 83–86

Easy | Medium | Multiple choice · past-paper questions

6	6	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Momentum from kinetic energy	Edexcel IAL October 2024 · Unit 4 · Q6	1 mark
2	Easy	Inelastic collision of trolleys	Edexcel IAL October 2024 · Unit 4 · Q7	1 mark
3	Easy	Momentum vector diagram for a decay	Edexcel IAL June 2024 · Unit 4 · Q2	1 mark
4	Medium	Ratio of momenta for equal kinetic energies	Edexcel IAL June 2025 · Unit 4 · Q9	1 mark
5	Medium	Speed after a glancing elastic collision	Edexcel IAL June 2021 · Unit 4 · Q7	1 mark
6	Medium	Momentum gained by a proton and an alpha particle	Edexcel IAL October 2025 · Unit 4 (alternative paper) · Q8	1 mark

Key ideas to have ready

- Momentum is conserved in all collisions; kinetic energy is conserved only in **elastic** collisions.
- Objects that stick together have an inelastic collision.
- $E_k = p^2/(2m)$, so $p = \sqrt{(2mE_k)}$.
- In 2D, draw a momentum vector triangle: initial momentum = vector sum of final momenta.

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 Pearson'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 1–3

Choose **one** answer for each question and put a cross in the box next to it.

Edexcel IAL October 2024 · Unit 4 · Q6

1 An electron has a kinetic energy of 3.5×10^{-28} J.

Which of the following gives the momentum of the electron in kg m s^{-1}?

☒ **A** $\dfrac{(3.5 \times 10^{-28})^2}{2 \times 9.11 \times 10^{-31}}$

☒ **B** $\dfrac{(9.11 \times 10^{-31})^2}{2 \times 3.5 \times 10^{-28}}$

☒ **C** $\sqrt{2 \times 1.6 \times 10^{-19} \times 3.5 \times 10^{-28}}$

☒ **D** $\sqrt{2 \times 9.11 \times 10^{-31} \times 3.5 \times 10^{-28}}$

Edexcel IAL October 2024 · Unit 4 · Q7

2 A moving trolley collides with a stationary trolley and they move off together.

Frictional forces are negligible and the collision is inelastic.

Which row of the table shows what happens to the total momentum and to the total kinetic energy in the collision?

		Total momentum	Total kinetic energy
☒	**A**	conserved	conserved
☒	**B**	conserved	not conserved
☒	**C**	not conserved	conserved
☒	**D**	not conserved	not conserved

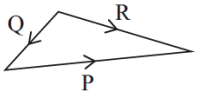
Edexcel IAL June 2024 · Unit 4 · Q2

3 A moving particle, P, decays. After the decay there are two particles, particle Q and particle R.

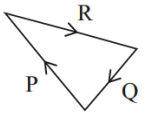
The diagram shows the momentum of particle Q and the momentum of particle R.



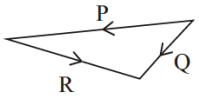
Which of the following is a correct vector diagram showing the momentum of particle P before the decay?



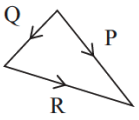
A



B



C



D

Medium

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

Questions 4–6

Edexcel IAL June 2025 · Unit 4 · Q9

4 In a nuclear fission reaction, a nucleus splits into a nucleus S, a nucleus T and several neutrons.

S and T have the same kinetic energy. T has twice the mass of S.

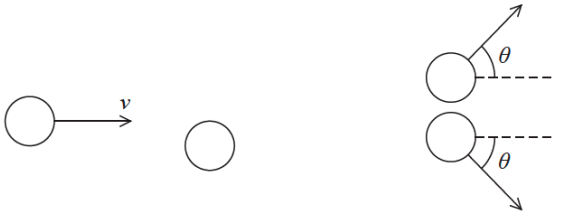
Which of the following is the ratio $\frac{\text{momentum of T}}{\text{momentum of S}}$?

- ☒ **A** $\frac{1}{2}$
- ☒ **B** $\frac{1}{\sqrt{2}}$
- ☒ **C** $\sqrt{2}$
- ☒ **D** 2

Edexcel IAL June 2021 · Unit 4 · Q7

5 A sphere travelling at speed v collides elastically with an identical sphere which is at rest.

After the collision, both spheres move off at an angle θ to the direction of travel of the first sphere, as shown. The spheres have the same speed as each other.



Before collision After collision

What is the speed of the spheres after the collision?

- ☒ **A** v
- ☒ **B** $\frac{v}{\sqrt{2}}$
- ☒ **C** $\frac{v}{2}$
- ☒ **D** $\frac{v}{4}$

Edexcel IAL October 2025 · Unit 4 (alternative paper) · Q8

6 A proton accelerates in an electric field and gains kinetic energy, giving it a change in momentum, Δp. An alpha particle accelerates in the same electric field and gains the same kinetic energy.

The magnitude of the change in momentum of the alpha particle is

- **A** $\sqrt{2}\,\Delta p$
- **B** $2\,\Delta p$
- **C** $\sqrt{8}\,\Delta p$
- **D** $4\,\Delta p$

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