GET BETTER AT PHYSICS · MARK SCHEME

Momentum & Collisions: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.4.1.6 · 6 questions · 6 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	Q5	Q6
D	A	C	B	A	A

Easy

Questions 1–3

1 **D**

What an inelastic collision conserves · AQA 2021 · AS Paper 2 · Q16

Momentum is conserved in every collision between isolated objects. In an inelastic collision some kinetic energy is transferred (for example to heat, sound and deformation), so total kinetic energy is not conserved.

2 **A**

Two objects sticking together · AQA June 2023 · AS Paper 2 · Q8

Momentum is conserved: $0.20u = (0.20 + 0.30)v$, so $v = 0.20u / 0.50 = 0.40u$.

Watch out: $0.67u$ (B) divides by the second object's mass only. After sticking, the combined mass moves.

3 **C**

Momentum of a falling object · AQA June 2024 · AS Paper 2 · Q20

Falling from rest, $v = gt$, so the momentum $p = mv = mgt$. With m and g constant, p is proportional to t.

Watch out: The distance fallen is proportional to t^2 (D), but momentum depends on velocity, not distance.

How students did: In June 2024 the correct answer was the most popular choice.

Medium

Questions 4–6

4 **B**

Railway trucks coupling together · AQA June 2019 · AS Paper 2 · Q26

Momentum is conserved: $2000 \times 1.5 = (2000 + 3000)v$, so $v = 0.6$ m s^{-1}. The trucks stick together, so the collision is inelastic and kinetic energy decreases (from 2250 J to 900 J).

Watch out: Only momentum is always conserved. Kinetic energy is conserved only in an elastic collision.

How students did: In June 2019 a significant number of students chose A, which says the kinetic energy does not change.

5 **A**

Rifle recoil · AQA June 2017 · AS Paper 2 · Q9

Before firing, the total momentum is zero. The system is isolated, so it is still zero afterwards. The bullet's momentum is 0.010 × 100 = 1.0 kg m s^{-1}, so the rifle has 1.0 kg m s^{-1} the other way: recoil velocity = 1.0 / 4.0 = 0.25 m s^{-1}.

> **Watch out:** 1.0 kg m s^{-1} is the momentum of the bullet alone. The rifle's momentum cancels it.

How students did: 45% of students got this right in June 2017; a third chose B.

6 **A**

Forces in an elastic collision · AQA June 2017 · AS Paper 2 · Q29

In an elastic collision the total kinetic energy is unchanged. By Newton's third law the two masses push on each other with forces of equal size. The smaller mass has a bigger acceleration, not a bigger force.

How students did: In June 2017 almost half of students chose B.

End of mark scheme

Answers from AQA's published keys; explanations written for this pack. AQA material is © AQA.
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