GET BETTER AT PHYSICS · MARK SCHEME

SUVAT & Free Fall: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.4.1.3 · 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
A	B	B	A	B	A

Easy

Questions 1–3

1 **A**

Prefixes: which journey is 1 mm? · AQA June 2023 · A-level Paper 1 · Q7

Distance = speed × time. A: 10×10^{-6} m s^{-1} × 100 s = 1×10^{-3} m = 1 mm. B gives 0.1 mm, C gives 1 m and D gives 10 mm.

How students did: Over 75% of students got this right in June 2023.

2 **B**

Estimating take-off speed in a jump · AQA June 2023 · A-level Paper 1 · Q8

A good standing jump lifts your centre of mass roughly 0.5–0.8 m. Using $v^2 = 2gh$, $v = \sqrt{(2 \times 9.81 \times 0.8)} \approx 4$ m s^{-1}. 2 m s^{-1} would only lift you about 0.2 m, and 8 m s^{-1} would lift you over 3 m.

How students did: In June 2023 A (2 m s^{-1}) was a popular wrong answer.

3 **B**

Drops falling from a tap · AQA November 2020 · A-level Paper 1 · Q21

Time for a drop to fall 0.80 m: $t = \sqrt{(2s / g)} = \sqrt{(2 \times 0.80 / 9.81)} = 0.40$ s. The next drop left 0.20 s later, so it has been falling for about 0.20 s: $s = ½ \times 9.81 \times 0.20^2 \approx 0.20$ m.

> **Watch out:** The answer is not half the height (0.40 m). In free fall the distance is proportional to t^2, so half the time gives a quarter of the distance.

Medium

Questions 4–6

4 **A**

Average speed and average velocity · AQA June 2016 · AS Paper 2 · Q20

She ends where she started, so the displacement and the average velocity are zero. Distance = 2.0 × 30 = 60 m out and 60 m back, so 120 m in 50 s: average speed = 2.4 m s^{-1}.

> **Watch out:** 2.5 m s^{-1} comes from averaging the two speeds (2.0 and 3.0 m s^{-1}). That only works when equal times are spent at each speed.

How students did: In June 2016 about as many students chose B as the correct answer.

5 **B**

Pellet stopping in a block · AQA June 2023 · AS Paper 2 · Q33

$v^2 = u^2 + 2as$, so the deceleration is $a = 40^2 / (2 \times 0.025) = 3.2 \times 10^4$ m s^{-2}. $F = ma = 0.025 \times 3.2 \times 10^4 = 800$ N. (Or: kinetic energy ½ × 0.025 × 40² = 20 J, and 20 J / 0.025 m = 800 N.)

> **Watch out:** Convert 25 g to 0.025 kg and 2.5 cm to 0.025 m before you start.

6 **A**

Golf on the Moon · AQA June 2016 · AS Paper 2 · Q21

The flight is symmetrical, so the ball takes 2.0 s to reach its highest point. Falling back from rest in 2.0 s: $h = \frac{1}{2}gt^2 = \frac{1}{2} \times 1.6 \times 2.0^2 = 3.2$ m, about 3 m.

> **Watch out:** Using the whole 4.0 s gives 12.8 m, which is why B looks tempting.

How students did: Only 32% of students got this right in June 2016, and about half 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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