GET BETTER AT PHYSICS · MARK SCHEME

Stationary Waves: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.3.1.3 · 8 questions · 8 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	Q7	Q8
B	D	C	A	D	C	D	A

Easy

Questions 1–3

1 **B**

Finding the harmonic number from node spacing · AQA June 2025 · AS Paper 2 · Q16

Adjacent nodes are λ/2 apart, and the string length is fixed: L = N × 0.60 = (N + 1) × 0.48. So 0.60N = 0.48N + 0.48, which gives 0.12N = 0.48 and N = 4.

Watch out: The length of the string doesn't change, so equate the two expressions for L.

2 **D**

Statements about harmonics on a 1.0 m rope · AQA November 2020 · A-level Paper 1 · Q18

The fifth harmonic has five loops, so it has six nodes (the two fixed ends count), not five: D is the incorrect statement. A (λ = 2L = 2.0 m), B (even harmonics have a node at the middle) and C (λ = 0.4 m is the fifth harmonic) are all correct.

Watch out: Count the fixed ends as nodes.

3 **C**

Properties of a stationary wave · AQA June 2022 · AS Paper 2 · Q18

Particles in neighbouring loops move in opposite directions, so the oscillations at two adjacent antinodes are in antiphase.

Watch out: Nodes have zero amplitude (A), adjacent nodes are λ/2 apart (B), and every point oscillates with the same period (D).

Medium

Questions 4–6

4 **A**

Phase and amplitude of three points · AQA November 2021 · A-level Paper 1 · Q18

P and Q are in the same loop, at equal distances either side of the antinode, so they are in phase and have the same amplitude. R is in the neighbouring loop, so it is in antiphase with P: row A.

Watch out: On a stationary wave, all points within one loop are in phase; the amplitude depends on the position.

How students did: In November 2021 more students chose D than the correct answer.

5 **D**

Touching a string one third of the way along · AQA June 2018 · AS Paper 2 · Q17

Touching the string forces a node at L/3. The lowest frequency that has a node there has three loops, the third harmonic, so the frequency is 3f.

Watch out: A node at L/3 is not compatible with one or two loops.

How students did: 31.3% of students got this right in June 2018.

6 **C**

Tripling the tension in a vibrating wire · AQA June 2025 · AS Paper 2 · Q5

Adding 2M makes the hanging mass 3M, so the tension triples. $f \propto \sqrt{T}$, so the new frequency is $420 \times \sqrt{3} = 727$ Hz ≈ 730 Hz.

> **Watch out:** Frequency is proportional to √T, not to T.

How students did: In June 2025 the correct answer was the most popular choice.

Hard

Questions 7–8

7 **D**

Wavelength from two resonance lengths · AQA June 2024 · A-level Paper 1 · Q15

The air column is closed at the water surface and open at the top. The first maximum is at $L_1 = \lambda/4$ and the next at $L_2 = 3\lambda/4$. So $L_2 - L_1 = \lambda/2$ and $\lambda = 2(L_2 - L_1)$.

> **Watch out:** Using the difference $L_2 - L_1$ avoids any error from the exact position of the antinode at the open end.

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

8 **A**

Which quantity is proportional to f? · AQA June 2025 · A-level Paper 1 · Q14

$f = (1/2L)\sqrt{(T/\mu)}$. For wires of the same material, $\mu = \rho \times \pi d^2/4 \propto d^2$, so $f \propto 1/d$. A graph of 1/d against f is a straight line through the origin.

> **Watch out:** $f \propto \sqrt{T}$, so it is T (not T^2) that is proportional to f^2; D is a trap.

How students did: Fewer than 20% of students got this right in June 2025; about 60% chose D.

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

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