GET BETTER AT PHYSICS · MARK SCHEME

Mass–Spring Systems & Pendulums: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.6.1.3 · 5 questions · 5 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
C	A	B	C	B

Medium

Questions 1–5

1 **C**

Frequency of a mass on a spring · AQA November 2020 · A-level Paper 1 · Q25

$f = (1 / 2\pi)\sqrt{(k / m)} = (1 / 2\pi)\sqrt{(80 \div 0.90)} = 9.43 \div 2\pi = 1.50$ Hz.

Watch out: 0.67 Hz (B) is the period, not the frequency.

2 **A**

How frequency depends on the hanging mass · AQA June 2019 · A-level Paper 1 · Q31

$T = 2\pi\sqrt{(m / k)}$, so $f = 1/T = (1 / 2\pi)\sqrt{(k / m)}$. With k fixed, $f \propto m^{-½}$.

Watch out: A bigger mass oscillates more slowly, so the power of m must be negative.

3 **B**

Length of a pendulum whose period doubles · AQA November 2020 · A-level Paper 1 · Q30

$T \propto \sqrt{l}$, so doubling T needs four times the length: $4l = l + 1.8$, so $3l = 1.8$ and $l = 0.60$ m.

Watch out: $T \propto \sqrt{l}$, so doubling the period needs four times the length, not twice.

4 **C**

When two pendulums are next in phase · AQA June 2019 · A-level Paper 1 · Q30

B is faster, so they are next in phase when B has made exactly one more oscillation than A. If A makes N oscillations: $2.00N = 1.98(N + 1)$, so $0.02N = 1.98$ and $N = 99$.

Watch out: 100 (D) is the number of oscillations of B, not A.

How students did: Less than half of students got this right in June 2019.

5 **B**

Period on a stiffer spring · AQA June 2024 · A-level Paper 1 · Q31

$k = Mg / x$. The second spring extends by $x/2$ for the same mass, so its stiffness is $2k$. $T = 2\pi\sqrt{(M / k)} \propto 1/\sqrt{k}$, so the new period is $T / \sqrt{2}$.

Watch out: Half the extension means double the stiffness, not half.

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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