FREE REVISION PACK

Simple Harmonic Motion

AQA A-level Physics · 7408 · Specification 3.6.1.2

Easy | Medium | Multiple choice · past-paper questions

6	6	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Maximum speed from the period and amplitude	AQA June 2022 · A-level Paper 1 · Q31	1 mark
2	Easy	Reading a displacement–time graph	AQA June 2017 · A-level Paper 1 · Q32	1 mark
3	Easy	Speed at a given displacement	AQA June 2024 · A-level Paper 1 · Q30	1 mark
4	Medium	Pendulum bob when its acceleration is zero	AQA June 2025 · A-level Paper 1 · Q25	1 mark
5	Medium	Phase between displacement and acceleration	AQA June 2018 · A-level Paper 1 · Q29	1 mark
6	Medium	Minimum value at the end of the oscillation	AQA June 2023 · A-level Paper 1 · Q31	1 mark

Key ideas to have ready

- SHM: acceleration is proportional to displacement and directed towards the equilibrium position: $a = -\omega^2 x$.
- $x = A\cos\omega t$; $v = \pm\omega\sqrt{(A^2 - x^2)}$; maximum speed $v_{max} = \omega A$; maximum acceleration $a_{max} = \omega^2 A$. $\omega = 2\pi f = 2\pi / T$.
- At equilibrium: speed and kinetic energy maximum, acceleration and restoring force zero. At maximum displacement: speed zero, acceleration maximum.
- Acceleration is in antiphase with displacement (phase difference π rad); velocity is π/2 out of phase with both.

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 AQA'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

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2022 · A-level Paper 1 · Q31

1 A particle performs simple harmonic motion with a time period of $1.4\ \text{s}$ and an amplitude of $12\ \text{mm}$.

What is the maximum speed of the particle?

[1 mark]

A $8.6\ \text{mm s}^{-1}$ ⬭

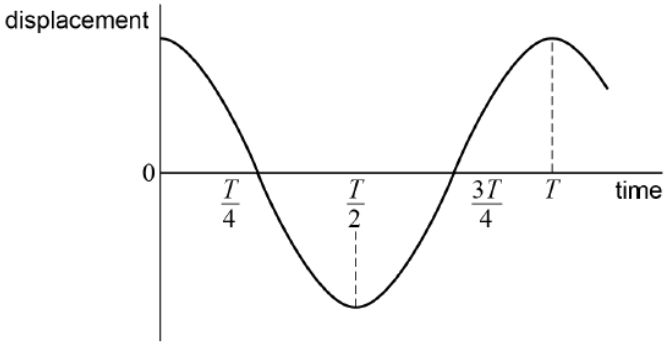
B $27\ \text{mm s}^{-1}$ ⬭

C $54\ \text{mm s}^{-1}$ ⬭

D $110\ \text{mm s}^{-1}$ ⬭

AQA June 2017 · A-level Paper 1 · Q32

2 The graph shows how the displacement of a particle performing simple harmonic motion varies with time.



Which statement is **not** correct?

[1 mark]

A The speed of the particle is a maximum at time $\frac{T}{4}$ ⬭

B The potential energy of the particle is zero at time $\frac{3T}{4}$ ⬭

C The acceleration of the particle is a maximum at time $\frac{T}{2}$ ⬭

D The restoring force acting on the particle is zero at time T ⬭

AQA June 2024 · A-level Paper 1 · Q30

3 A body is in simple harmonic motion of amplitude $0.60\ \text{m}$ and period 2π seconds.

What is its speed when its displacement is $0.20\ \text{m}$?

[1 mark]

A $0.32\ \text{m s}^{-1}$ ⬭

B $0.57\ \text{m s}^{-1}$ ⬭

C $0.63\ \text{m s}^{-1}$ ⬭

D $22\ \text{m s}^{-1}$ ⬭

Medium

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

Questions 4–6

AQA June 2025 · A-level Paper 1 · Q25

4 A pendulum is oscillating with simple harmonic motion.

Which row gives the momentum of the pendulum bob and its gravitational potential energy (GPE) when the acceleration of the pendulum bob is zero?

[1 mark]

	Momentum	GPE	
A	zero	maximum	⬭
B	maximum	minimum	⬭
C	maximum	maximum	⬭
D	zero	minimum	⬭

AQA June 2018 · A-level Paper 1 · Q29

5 A body performs simple harmonic motion.

What is the phase difference between the variation of displacement with time and the variation of acceleration with time for the body?

[1 mark]

A 0 ⬭

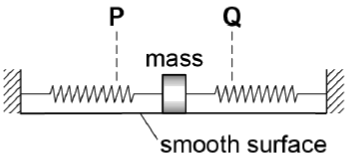
B $\frac{\pi}{4}$ rad ⬭

C $\frac{\pi}{2}$ rad ⬭

D π rad ⬭

AQA June 2023 · A-level Paper 1 · Q31

6 A mass, attached to two springs, oscillates horizontally between **P** and **Q**. The motion of the system is simple harmonic.



Which quantity has its magnitude at a minimum value when the mass is at **Q**?

[1 mark]

A the acceleration of the mass ⬭

B the kinetic energy of the mass ⬭

C the potential energy of the mass–spring system ⬭

D the resultant force of the springs on the mass ⬭

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