FREE REVISION PACK

Phase & Path Difference

AQA A-level Physics · 7407 / 7408 · Specification 3.3.1.1, 3.3.2.1

Easy | Medium | Multiple choice · past-paper questions

6	6	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Path difference in wavelengths	AQA June 2018 · A-level Paper 1 · Q15	1 mark
2	Easy	Converting radians to degrees	AQA 2020 · AS Paper 2 · Q13	1 mark
3	Easy	Wave speed from a phase difference	AQA June 2025 · AS Paper 2 · Q9	1 mark
4	Medium	Phase difference on a sound wave	AQA June 2016 · AS Paper 2 · Q12	1 mark
5	Medium	Statements about points on a transverse wave	AQA November 2020 · A-level Paper 1 · Q16	1 mark
6	Medium	Frequency from a phase difference	AQA June 2018 · AS Paper 2 · Q19	1 mark

Key ideas to have ready

- Phase difference between two points on a wave = 2π × (separation ÷ λ) radians, or 360° × (separation ÷ λ).
- Points one whole wavelength apart are in phase; points λ/2 apart are in antiphase (π rad). 1 rad = 180°/π ≈ 57.3°.
- Path difference is the difference in distance travelled by two waves. Expressing it in wavelengths tells you the phase difference.
- Find λ first from v = fλ when you are given speed and frequency.

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

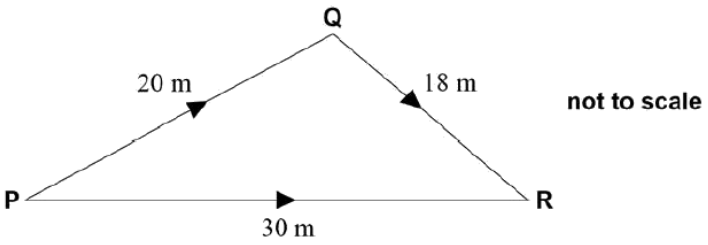
Definitions and one-step ideas. Most students get these right.

Questions 1–3

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

AQA June 2018 · A-level Paper 1 · Q15

1 In the diagram, **P** is the source of a wave of frequency 50 Hz



The wave travels to **R** by two routes, **P** → **Q** → **R** and **P** → **R**. The speed of the wave is $30\ \text{m s}^{-1}$

What is the path difference between the two waves at **R** in terms of the wavelength λ of the waves?

[1 mark]

A 4.8λ ⬭

B 8.0λ ⬭

C 13.3λ ⬭

D 20.0λ ⬭

AQA 2020 · AS Paper 2 · Q13

2 Two points on a progressive wave are out of phase by 0.41 rad.

What is this phase difference?

[1 mark]

A 23° ⬭

B 47° ⬭

C 74° ⬭

D 148° ⬭

AQA June 2025 · AS Paper 2 · Q9

3 The minimum distance between two points on a progressive wave with a phase difference of $\frac{\pi}{2}$ is $0.040\ \text{m}$.

The frequency of the wave is $400\ \text{Hz}$.

What is the speed of the wave?

[1 mark]

A $16\ \text{m s}^{-1}$ ⬭

B $32\ \text{m s}^{-1}$ ⬭

C $64\ \text{m s}^{-1}$ ⬭

D $128\ \text{m s}^{-1}$ ⬭

Medium

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

Questions 4–6

AQA June 2016 · AS Paper 2 · Q12

4 What is the phase difference between two points $0.16\ \text{m}$ apart on a progressive sound wave of frequency $256\ \text{Hz}$?

[1 mark]

speed of sound = $330\ \text{m s}^{-1}$

A $\frac{\pi}{8}$ ⬭

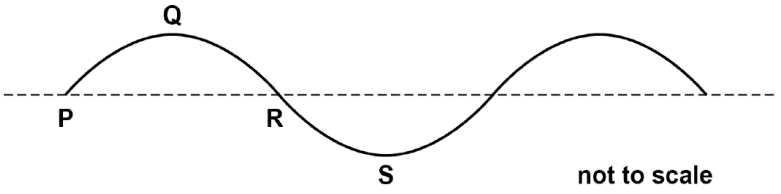
B $\frac{\pi}{6}$ ⬭

C $\frac{\pi}{4}$ ⬭

D $\frac{\pi}{3}$ ⬭

AQA November 2020 · A-level Paper 1 · Q16

5 The diagram shows the cross-section of a progressive transverse wave travelling at $24\ \text{cm s}^{-1}$ on water. The amplitude of the wave is $2.0\ \text{cm}$ and the frequency is $4.0\ \text{Hz}$.



Which statement is correct?

[1 mark]

A The phase difference between particles at **P** and **S** is $\frac{\pi}{2}\text{rad}$. ⬭

B The distance between **P** and **R** is $6.0\ \text{cm}$. ⬭

C The particle velocity at **Q** is a maximum. ⬭

D Particles at **P** and **R** are in phase. ⬭

AQA June 2018 · AS Paper 2 · Q19

6 Two points on a progressive wave have a phase difference of $\frac{\pi}{6}$ rad
The speed of the wave is $340\ \text{m s}^{-1}$

What is the frequency of the wave when the minimum distance between the two points is $0.12\ \text{m}$?

[1 mark]

A 240 Hz ⬭

B 470 Hz ⬭

C 1400 Hz ⬭

D 2800 Hz ⬭

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