

GCSE Physics

Worksheet: Properties of waves

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Properties of waves

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

01

01.1

Write down the equation that links wave speed, frequency and wavelength.

[1 mark]

01.2

A wave has a frequency of 4.0 Hz and a wavelength of 0.50 m.
Calculate its wave speed.

Wave speed = m/s

[2 marks]

0 1 . 3

Which row shows the correct unit for each quantity?

Tick (✓) **one** box.

frequency: Hz, wavelength: m, wave speed: m/s

☐

frequency: s, wavelength: m, wave speed: m/s

☐

frequency: Hz, wavelength: s, wave speed: m/s

☐

frequency: Hz, wavelength: m, wave speed: m

☐

[1 mark]

0 2

A buoy on the sea bobs up and down as waves pass it. It takes 4 s to complete one full up-and-down movement.

0 2 . 1

Calculate the frequency of the buoy's motion.

Use the equation:

$$\text{period} = \frac{1}{\text{frequency}}$$

.....

.....

.....

.....

Frequency = Hz

[2 marks]

0 3

A water wave in a ripple tank has a frequency of 20 Hz and a wavelength of 0.012 m.

0 3 . 1

Calculate the speed of the wave.

Use the equation:

wave speed = frequency $\times$ wavelength

.....

.....

.....

.....

Wave speed = m/s

[2 marks]

0 4

The prongs of a tuning fork vibrate with a frequency of 500 Hz.

0 4 . 1

Calculate the period of the vibration of the prongs.

Use the equation:

$$\text{period} = \frac{1}{\text{frequency}}$$

.....

.....

.....

.....

Period = s

[2 marks]

0 5

To measure the wavelength, a student uses a stroboscope to 'freeze' the wave pattern and measures the distance across five complete wavelengths with a ruler, repeating the measurement three times: 42 mm, 44 mm and 43 mm.

0 5 . 1

Explain why measuring across five wavelengths, rather than just one, gives a more precise value of the wavelength.

.....

.....

[1 mark]

0 5 . 2

Calculate the mean distance across five wavelengths, and hence the mean wavelength.

.....

.....

.....

.....

.....

Wavelength = mm

[3 marks]

0 5 . 3

Are these three repeat measurements repeatable? Justify your answer.

.....

.....

[1 mark]

0 6

A student uses a ripple tank to investigate water waves. A lamp above the tank projects a pattern of bright and dark lines onto a sheet of paper below the tank.

The distance across 5 wavelengths on the paper is 22.5 cm.

The student counts 50 waves passing a fixed point in 10 s.

0 6 . 1

Calculate the wavelength of the waves in metres.

.....

.....

.....

.....

Wavelength = m

[2 marks]

0 6 . 2

Calculate the frequency of the waves.

.....

.....

.....

.....

Frequency = Hz

[2 marks]

0 6 . 3

Calculate the speed of the waves.

.....

.....

.....

.....

.....

Speed = m/s

[3 marks]

0 6 . 4

Suggest why the student measured the distance across 5 wavelengths, rather than across one wavelength.

.....

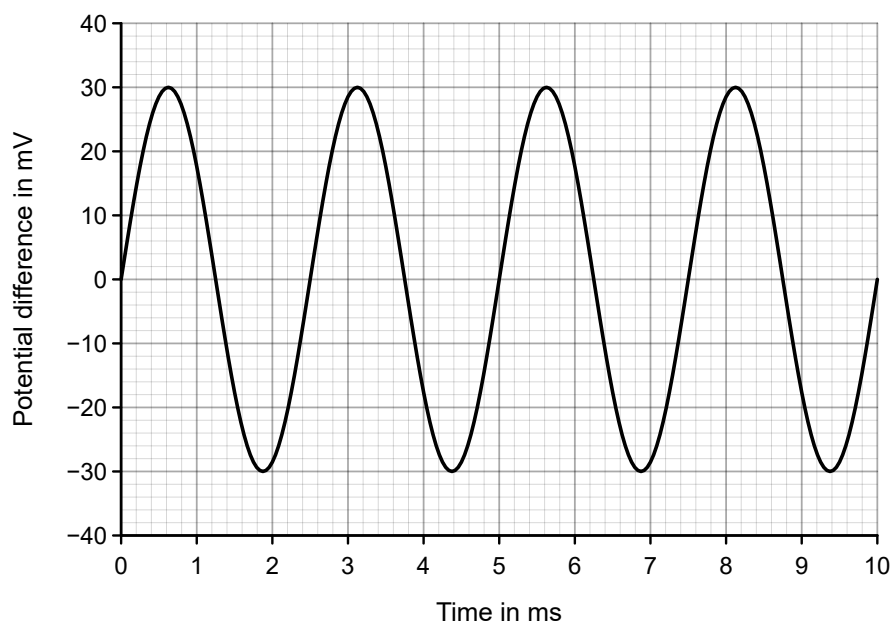
.....

[1 mark]

0 7

A student uses a microphone connected to a data logger to record a sound. Figure 1 shows how the potential difference across the microphone changes with time.

Figure 1



0 7 . 1

Use Figure 1 to determine the period of the sound wave.

.....

.....

.....

.....

Period = ms

[2 marks]

0 7 . 2

Calculate the frequency of the sound wave.
Use the Physics Equations Sheet.

.....

.....

.....

.....

Frequency = Hz

[2 marks]

0 7 . 3

The speed of sound in air is 340 m/s.
Calculate the wavelength of the sound wave.

.....

.....

.....

.....

.....

Wavelength = m

[3 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Properties of waves · 30 marks

Question 1 (4 marks)

01.1 [1 mark]

Answer: wave speed = frequency $\times$ wavelength

- wave speed = frequency $\times$ wavelength (1)

Notes: Allow $v = f\lambda$.

01.2 [2 marks]

Answer: 2.0 m/s

- 4.0×0.50 (1)
 - 2.0 (m/s) (1)
-

01.3 [1 mark]

Correct: frequency: Hz, wavelength: m, wave speed: m/s

Question 2 (2 marks)

02.1 [2 marks]

Answer: 0.25 Hz

- $1 \div 4$ (1)
 - 0.25 (Hz) (1)
-
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: 0.24 m/s

- 20×0.012 (1)
 - 0.24 (m/s) (1)
-

Question 4 (2 marks)

04.1 [2 marks]

Answer: 0.002 s

- $1 \div 500$ (1)
 - 0.002 (s) (1)
-

Question 5 (5 marks)

05.1 [1 mark]

Answer: The uncertainty from the ruler's resolution is the same whether measuring one or five wavelengths, but it becomes a much smaller fraction of the (five times bigger) distance measured, so dividing by five gives a smaller percentage uncertainty.

- the (fixed) uncertainty from the ruler's resolution becomes a much smaller fraction of a bigger distance, so measuring across several wavelengths and dividing gives a smaller percentage uncertainty in the wavelength (1)
-

05.2 [3 marks]

Answer: 8.6 mm

- mean distance = $(42 + 44 + 43) \div 3 = 43$ (mm) (1)
 - wavelength = $43 \div 5$ (1)
 - = 8.6 (mm) (1)
-

05.3 [1 mark]

Answer: Yes — the three distances are close together (within 2 mm), obtained with the same equipment and method.

- yes — the three distances are close together (within 2 mm), using the same equipment and method (they are repeatable) (1)
-

Question 6 (8 marks)

06.1 [2 marks]

Answer: 0.045 m

- $22.5 \div 5 = 4.5$ (cm) (1)
 - 0.045 (m) (1)
-

06.2 [2 marks]

Answer: 5 Hz

- $50 \div 10$ (1)
 - 5 (Hz) (1)
-

06.3 [3 marks]

Answer: 0.225 m/s

- wave speed = frequency $\times$ wavelength (1)
- 5×0.045 (1)
- 0.225 (m/s) (1)

Notes: Allow ECF from the wavelength and the frequency.

06.4 [1 mark]

Answer: Measuring across several wavelengths reduces the uncertainty in the value of one wavelength.

- to reduce the (percentage) uncertainty in the value of the wavelength / to make the value of the wavelength more accurate (1)
-

Question 7 (7 marks)

07.1 [2 marks]

Answer: 2.5 ms

- time for several complete waves read, e.g. 4 waves take 10 ms (1)
- 2.5 (ms) (1)

07.2 [2 marks]

Answer: 400 Hz

- $f = 1 \div 0.0025$ (1)
- 400 (Hz) (1)

Notes: Allow ECF from the period. 0.4 scores 1 mark (period left in ms).

07.3 [3 marks]

Answer: 0.85 m

- $340 = 400 \times \lambda$ (1)
- $\lambda = 340 \div 400$ (1)
- 0.85 (m) (1)

Notes: Allow ECF from the frequency.
