

Wave Speed

The two wave speed formulas

In words _____

In symbols _____

Write the unit of each quantity

 v _____ f _____ λ _____

In words _____

In symbols _____

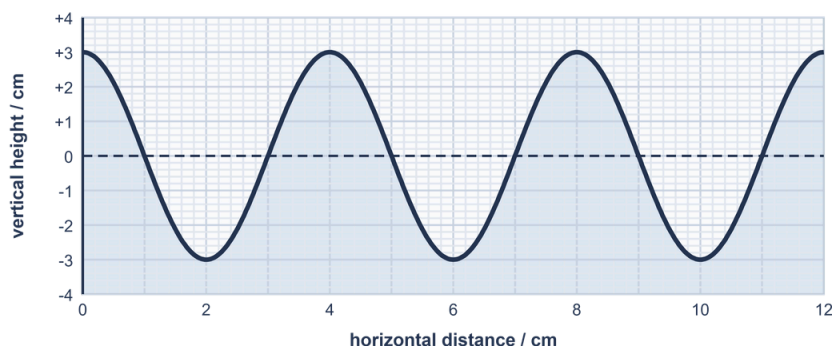
Write the unit of each quantity

 v _____ s _____ t _____

KEY VARIABLES

- | | |
|-------------------------------------|-----------|
| ☐ Wave speed | v |
| ☐ Frequency | f |
| ☐ Wavelength | λ |
| ☐ Distance | s |
| ☐ Time | t |

Example — a water wave



The frequency of this water wave is **5 Hz**. Calculate its speed in **m/s**. Give your answer to **2 significant figures**.

Careful: everything on the graph is in **cm**. Change to metres before you use the formula.

- 1 Wavelength = _____ cm
- 2 In metres = _____ m
- 3 $v = f \times \lambda =$ _____
- 4 Wave speed = _____ m/s

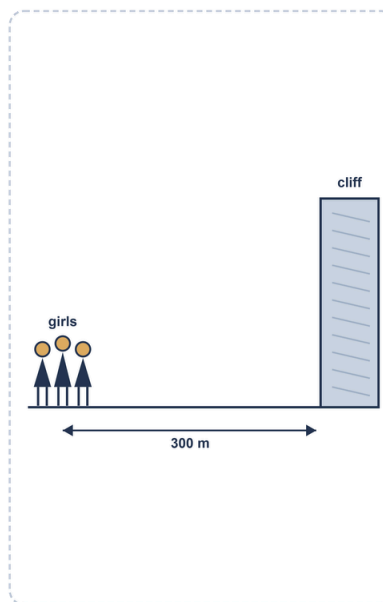
Exam-style question — echo off a cliff

A group of girls sing a note on a beach. The note has a frequency of **425 Hz** and a wavelength of **0.80 m**.

- (a) Calculate the speed of sound in air. [2]
- (b) The girls stand **300 m** from a cliff and hear an echo. Sound waves are longitudinal. Explain what causes the echo. [1]
- (c) Draw a ray diagram of the sound wave. [1]
- (d) Calculate the time between the girls singing and hearing the echo. [3]

(Total for question = 7 marks)

(C) DRAW A RAY DIAGRAM OF THE SOUND WAVE



ANSWER

HINTS 1 Part (a): use $v = f \times \lambda$. 2 The sound goes **to the cliff and back**. What distance is that? 3 Rearrange $v = s \div t$ to find t .

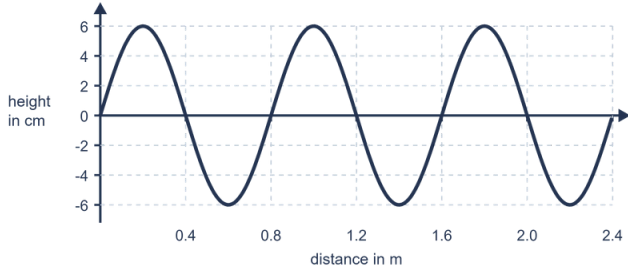
Wave Types, Properties and Formulas

This is a past-paper style question on 4.6.1.1–4.6.1.2. There are no steps to follow — read each part carefully, **show all your working**, and **give the unit** when you are asked for it.

Question 1 — part (a)

[2 marks]

The graph shows a water wave in a ripple tank at one instant in time.



- (a)(i) What is the wavelength of the water wave? (1)
- ☐ A 0.2 m ☐ B 0.4 m
- ☐ C 0.8 m ☐ D 1.6 m
- (ii) What is the amplitude of the water wave? (1)
- ☐ A 3 cm ☐ B 6 cm
- ☐ C 12 cm ☐ D 24 cm

Question 1 — parts (b) and (c)

[11 marks]

A buoy floats on the sea. It is held in place by a chain fixed to the seabed.

As waves pass, the buoy moves up and down between level **X** and level **Y**.

- (b)(i) On the diagram, draw a line to show one wavelength. Label your line with the letter **W**. (1)

- (ii) The vertical distance from X to Y is 1.2 m. Determine the amplitude of the wave. (1)

amplitude = _____ m

- (iii) The buoy reaches level X every 4.0 s. Calculate the frequency of the wave. Give the unit. (3)

frequency = _____ unit _____

- (iv) The wavelength of the sea waves is 6.0 m. Calculate the speed of the waves. (2)

speed = _____ m/s

- (v) Explain how the movement of the buoy shows that a water wave is a transverse wave. (2)

- (vi) The buoy moves up and down, but it does not travel along with the wave. State what the wave transfers. (1)

- (c) Give **one** example of a longitudinal wave. (1)

(Total for Question 1 = 13 marks)