

Section A

1) the light that travels from the stars transfers

- ☐ A: charge
☐ B: energy
☐ C: mass
☐ D: matter

2) What is the standard unit for frequency?

- ☐ A: Hz
☐ B: m/s
☐ C: m
☐ D: s

3) Which of these is a longitudinal wave?

- ☐ A: visible light
☐ B: sound
☐ C: water
☐ D: ultraviolet

4) What word means 'material a wave travel through'?

- ☐ A: surplus
☐ B: density
☐ C: medium
☐ D: maximum

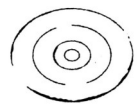
5) Waves changing direction when passing from one material into another is called

- ☐ A: rarefaction
☐ B: reflection
☐ C: translation
☐ D: refraction

6) Which is an equation for calculating wave speed?

- ☐ A: $v = f \div \lambda$
☐ B: $v = f \times \lambda$
☐ C: $v = \lambda \div f$

Ripples spread out from the location where a stone is thrown into a pond.



Which type of wave was produced in the pond? Longitudinal or transverse?

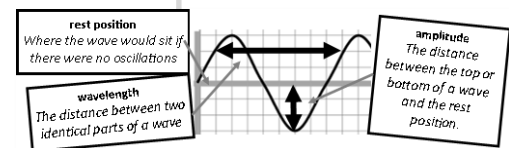


Describe how the frequency of the waves could be calculated.

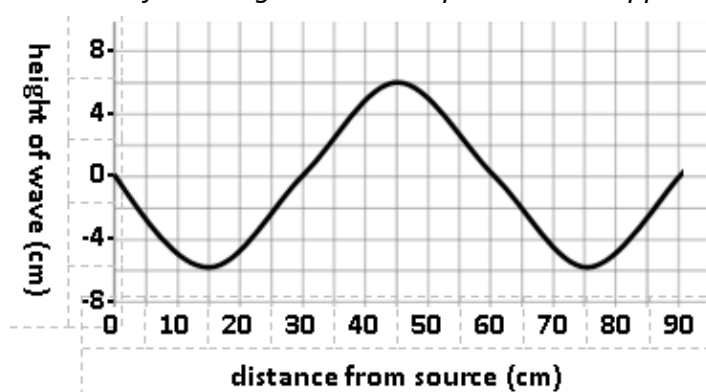
Key Word:
Transverse
 Oscillations are perpendicular to the direction of the wave

↓ Which of these shows the movement of a lily pad on the pond as the ripples pass under it?

- ☐ A
☐ B
☐ C
☐ D



The waveform diagram below represents the ripples.



↑ Draw an additional wave on the axes with twice the frequency and half the amplitude of the current one.

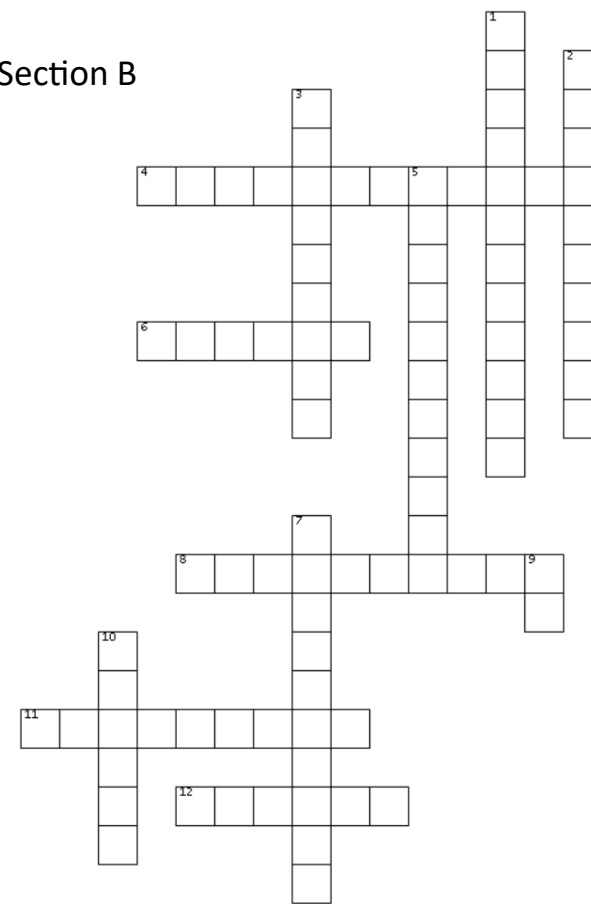
← What is the wavelength of the wave?

← What is the amplitude of the wave?

← How many wavelengths are shown in the diagram?

The diagram records the wave over three seconds. So what is the frequency of the wave?

Section B



WORD BANK
 wavelength;
 refraction;
 towards;
 direction;
 more.

Key Word:
Medium
 (plural: media)
 Material that a wave travels through

↓ Fill the missing words,

Waves travel at different speeds in different media.
 If a wave slows down, for example by passing in to a dense material, the waves will be more squashed together and the decreases

If a wave travels into a different material at an angle then the wave will change

This process is called

If the wave travels into a more dense material the wave will change direction the normal line.

The opposite happens if the wave travels into a less dense material.

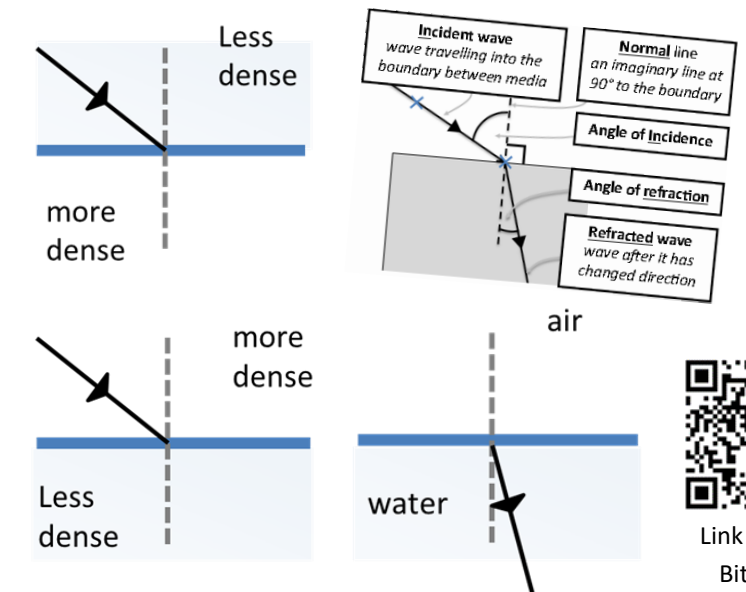
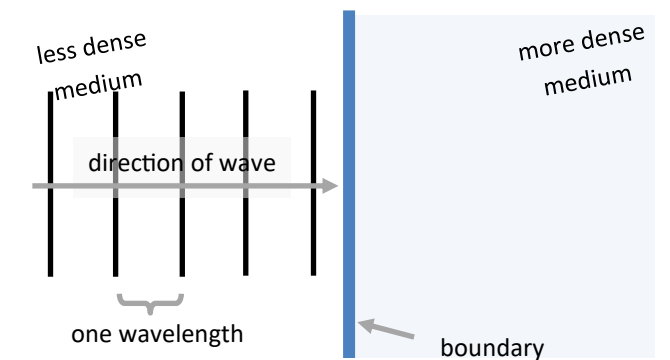
ACROSS

4. Where a wave would sit if there were no oscillations. (4, 8)
 6. A space where there are no particles. Sound waves cannot travel through this. (6)
 8. The distance covered by one full wave. (10)
 11. The number of waves passing a point each second. (9)
 12. The time take for one full wave to pass a point. (6)

DOWN

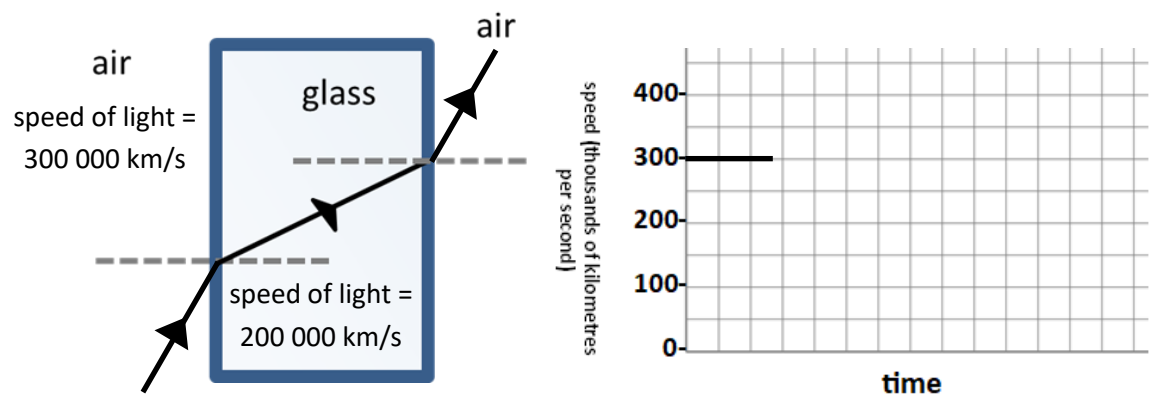
1. Any wave formed of oscillations that are parallel/in the same direction that the wave is travelling in. (12)
 2. Any wave formed of oscillations that are perpendicular to the direction that the wave is travelling in. (10)
 3. The maximum distance between the top or bottom of a wave and the rest position. (9)
 5. One of the two things that waves can transfer. (11)
 7. A change in direction when a wave travels from one medium into another medium with a different density. (10)
 9. The unit for frequency. (2)
 10. One of the two things that waves can transfer. (6)

then add the missing waves/rays to the diagrams below. ↓



Section C

Finish the graph to show how the speed of the light wave changes as it moves into, through and out of the glass block.



A class investigates the speed of sound in air by starting a timer when they see a firework explode and stopping when they hear it.

bang

600 m

Why do the students see the firework explode before they hear it?

Write the average of their results into the table

Group	1	2	3	4	Average
Result (s)	1.71	1.92	1.55	1.61	

Use their results to calculate the speed of sound in air.

A scientist uses a ripple tank to investigate the speed of water waves. They annotate the diagram with results.

What is the wavelength of the shadows in m?

☐ A: 0.42

☐ B: 3.00

☐ C: 0.03

☐ D: 5.04

What is the frequency of the waves?

☐ A: 1.50 Hz

☐ B: 0.67 Hz

☐ C: 12.0 Hz

☐ D: 504 Hz

What is the period of one wave?

☐ A: 1.50 Hz

☐ B: 0.67 Hz

☐ C: 12.0 Hz

☐ D: 504 Hz

12 shadows pass this leg in 8 seconds

the legs are 42 cm apart

Why is this **not** exactly equal to the wavelength of the waves in the ripple tank.

How could the results be used to work out the speed of the waves?

Ripple tanks
Are used to investigate water waves

light source

water

screen

Section D

wave speed = frequency $\times$ wavelength	$v = f \times \lambda$
wave speed = distance $\div$ time	$v = \frac{x}{t}$

An earthquake causes a sea wave.
This sea wave travels 26 400 m in two minutes.
(i) Calculate the speed of the wave.
(3)

The electromagnetic spectrum is continuous.
Different regions of the spectrum have different properties.
An electromagnetic wave has a frequency of 7×10^9 Hz.
The speed of the wave is 3×10^8 m/s.
(i) Calculate the wavelength of the wave.
(3)

speed = m/s		wavelength =m				
Sounds travels 1700 m in 5 s. Calculate the velocity of the sound wave.		A water wave with a wavelength of 0.2 m has a frequency of 0.5 Hz. Calculate the wave speed.		A student times 2.2 s between seeing lightning and hearing thunder. If sound travels at 340 m/s, how far away was the lightning from the student?		
A sound just above average human hearing has a frequency of 20 kHz. The speed of sound in air is 340 m/s. What is the wavelength of the sound wave?		When they were at their closest, light took roughly 3 minutes to reflect off Mars and travel to Earth. The speed of light is 3.0×10^8 m/s. What was the distance between them?		Microwave ovens use microwaves around 2.45 GHz. What is the wavelength of these microwaves? (microwaves travel at the speed of light, 300 000 km/s)		
Answers (in standard units)	748	0.12	340	0.017	0.1	5.4×10^{10}