Wave Behaviour (F)

1 (a). Ripples are made on the surface of the water. The ripples can be used to model waves.

i. State the type of wave modelled by the ripples.

_____ **[1]**

ii. Describe how the water molecules move as the wave travels across the pond.

_____

_____ **[1]**

iii. 10 ripples hit the side of the pond in 20 seconds.

Calculate the frequency of the ripples.

Frequency = ... Hz **[2]**

(b). Student **A** and student **B** drop stones into a pond.

i. Student **A** measures the frequency and wavelength of the water ripples. **Table 17.1** shows his results:

Frequency (Hz) of ripples	0.6
Wavelength (m) of ripples	0.1

Table 17.1

Calculate the wave speed of the ripples.

Use the equation: wave speed = frequency × wavelength

Wave speed = ...m / s **[2]**

ii. Student **B** measures the same ripples as student **A**.

She measures:

- The distance one ripple travels.
- The time it takes the ripple to travel this distance.

Table 17.2 shows student **B**'s results:

Distance ripple travels (m)	2.40
Time taken (s)	30.0

Table 17.2

Name the equipment student **B** uses to measure the distance and time.

Distance ----------

Time ----------

[2]

iii. Use results in **Table 17.2** to calculate the wave speed of the ripples.

Wave speed = ...m / s **[1]**

iv. Student **A** and student **B** obtained different answers for the wave speed of the ripples.

Suggest why.

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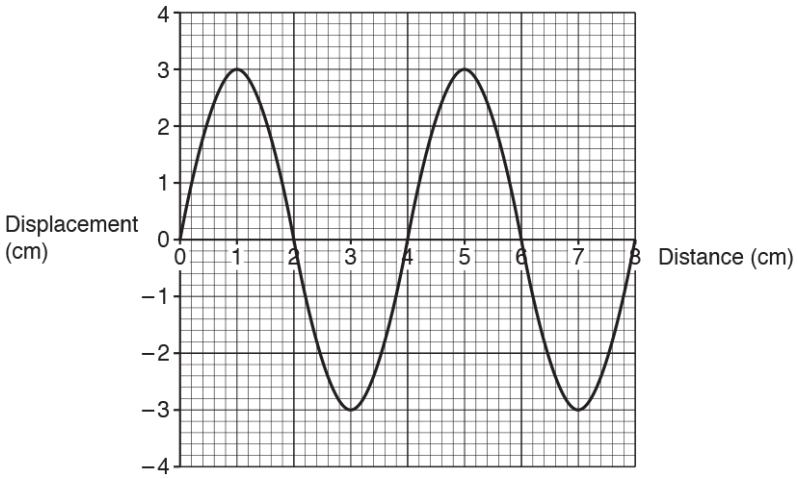
[1]

2. Look at the diagram of a wave.



What is the wavelength of the wave?

A 2 cm
B 3 cm
C 4 cm
D 6 cm

Your answer ☐ **[1]**

3 (a). A water wave has a frequency of 0.25 Hz and a wavelength of 6.0 m.

Calculate the speed of the wave.

Speed of the wave = ... m / s **[3]**

(b). Surface water waves can be modelled using a slinky spring.

A student holds one end of the spring on a table. The other end is fixed to a wall.

Fig. 20.2 shows the spring **viewed from above the table.**

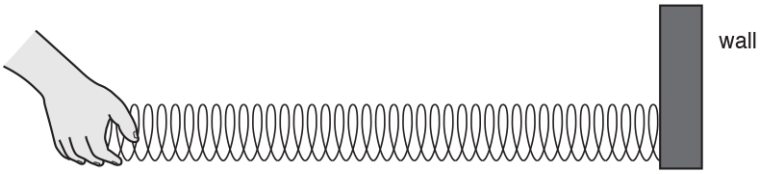


Fig. 20.2

i. Draw two arrows **on the diagram** in **Fig. 20.2** to show the movement of the student's hand when he makes a **transverse** wave.

[1]

ii. Describe what happens to the transverse wave at the wall.

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[1]

iii. In **Fig. 20.3** the student stops moving his hand.

This is what the coils in the spring look like after a short time:

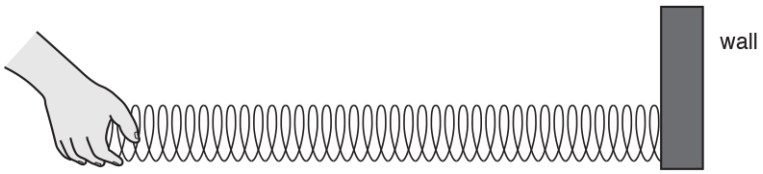

Fig. 20.3

This model of a water wave shows that the wave travels **not** the water.

Explain why.

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[1]

(c). Fig. 20.1 is a graph of a wave.

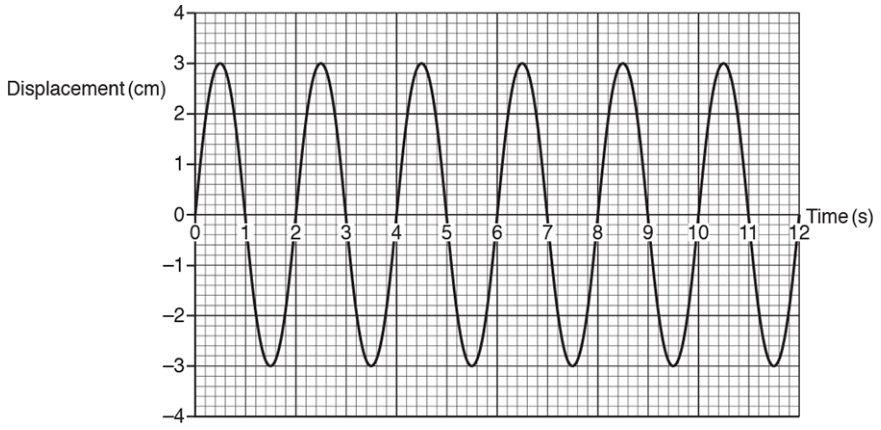

Fig. 20.1

i. Use the graph in **Fig. 20.1** to work out the time period of the wave.

Time period of the wave = ... s **[1]**

ii. Use the graph in **Fig. 20.1** to work out the amplitude of the wave.

Amplitude = ... cm **[1]**

iii. The frequency of the wave in **Fig. 20.1** is 0.5 Hz.

What is meant by the term **frequency**?

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[1]

4. A sound wave travels in air and enters water.

What happens to the sound wave as it enters the water?

	Speed	Frequency	Wavelength
A	decreases	decreases	decreases
B	decreases	stays the same	decreases
C	increases	increases	increases
D	increases	stays the same	increases

Your answer ☐ **[1]**

5. An electromagnetic wave transfers energy.

Which row in the table is correct?

	Electromagnetic wave	Energy transfer
A	Infra-red	From a heating element of a toaster to the bread inside
B	Radio	From a radio to a transmitter
C	Gamma rays	From a high voltage supply to heating water in food
D	X-rays	From bones in the body to an X-ray machine

Your answer ☐ **[1]**

6. A teacher measures the speed of water waves in a ripple tank.

What apparatus should she use?

A Ammeter and stopwatch
B Newton-meter and ruler
C Ruler and protractor
D Ruler and stopwatch

Your answer ☐ **[1]**

7. Which statement is **true** for electromagnetic waves?

A High frequency electromagnetic waves have a long wavelength.
B High frequency electromagnetic waves have no wavelength.
C Low frequency electromagnetic waves have a long wavelength.
D Low frequency electromagnetic waves have a short wavelength.

Your answer ☐ **[1]**

8. A student watches a ball game on the school field.

The student sees the ball being hit with a bat but he hears the sound a short time after. This is because the speed of light is greater than the speed of sound.

He decides to do an experiment to measure the speed of sound waves in air.

Describe one way he could get valid results for this experiment.

_____

_____ **[1]**

9. Fig. 20.1 shows thinking, braking and stopping distances for the same car travelling at different speeds.

Speed (m/s)	Thinking distance (m)	Braking distance (m)	Stopping distance (m)
8	6	6	12
16	12	24	36
32	24	96	120

Fig. 20.1

Describe how the **thinking distance** changes when the speed doubles.

Use data from the table in your answer.

_____

_____

_____ **[1]**

10 (a). A student watches a ball game on the school field.

The student sees the ball being hit with a bat but he hears the sound a short time after. This is because the speed of light is greater than the speed of sound.

He decides to do an experiment to measure the speed of sound waves in air.

Describe which measurements he needs to measure this speed.

_____

_____

_____ **[2]**

(b). Which equation is used to calculate speed?

_____ **[1]**

11. A student measures the time it takes for the sound from a firework to reach the observer.

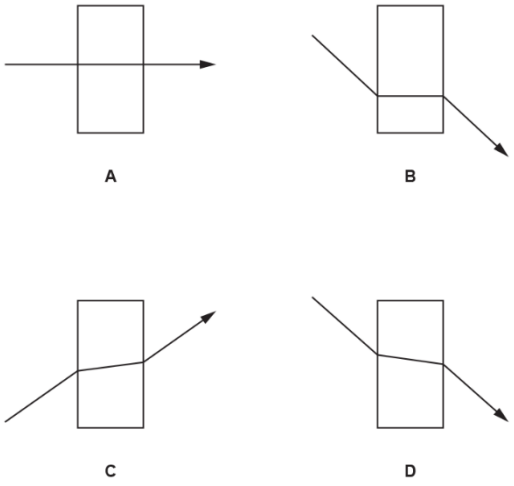
She takes 3 measurements of the time taken for four different distances, **A**, **B**, **C** and **D**.

Distance	Time taken (s)		
	1st measurement	**2nd measurement**	**3rd measurement**
A	2.16	2.19	2.17
B	1.99	2.02	1.97
C	1.80	1.81	1.89
B	1.69	1.68	1.71

Which distance **A**, **B**, **C** or **D**, has the largest range of values?

Your answer ☐ **[1]**

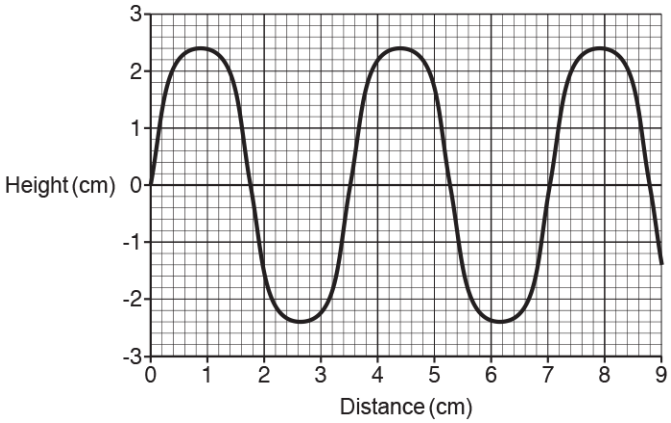
12. Look at the diagrams of a light ray as it passes from air through a glass block.



Which diagram shows an **incorrect** refraction?

Your answer ☐ **[1]**

13(a). Look at the diagram of a water wave.



i. What is the **wavelength** of this wave?

Answer = _____ cm **[1]**

ii. What is the **amplitude** of this wave?

Answer = _____ cm **[1]**

iii. The wavelength of the wave is changed to 25 cm. Two waves are produced each second.

Use the equation: Wave speed = Frequency × Wavelength

Calculate the speed of the wave.

Answer = _____ m/s **[2]**

(b). Water waves are transverse and sound waves are longitudinal.

i. Describe how water particles move in a **transverse** water wave.

_____

_____ **[1]**

ii. Describe how air particles move in a **longitudinal** sound wave.

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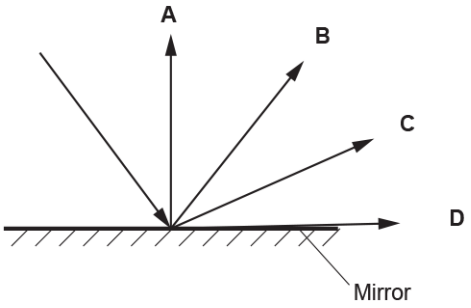
[1]

14. Which light ray shows the correct reflection from the plane (flat) mirror?



Your answer ☐ **[1]**

END OF QUESTION PAPER