

General Wave Properties

Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Waves
Topic	General Wave Properties
Booklet	Question Paper

Time Allowed: 50 minutes

Score: /42

Percentage: /100

Grade Boundaries:

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1 For a transverse wave, what is a *wavefront*?

- A a line joining all points on the same crest of a wave
- B a line showing the displacement of a wave
- C the energy content of a wave
- D the first part of a wave to reach a point

2 A longitudinal wave passes along a spring. The coils of the spring vibrate from side to side.

The diagram shows the positions of the coils at one particular time.



Which positions are one wavelength apart?

- A W and X
- B W and Z
- C X and Z
- D Y and Z

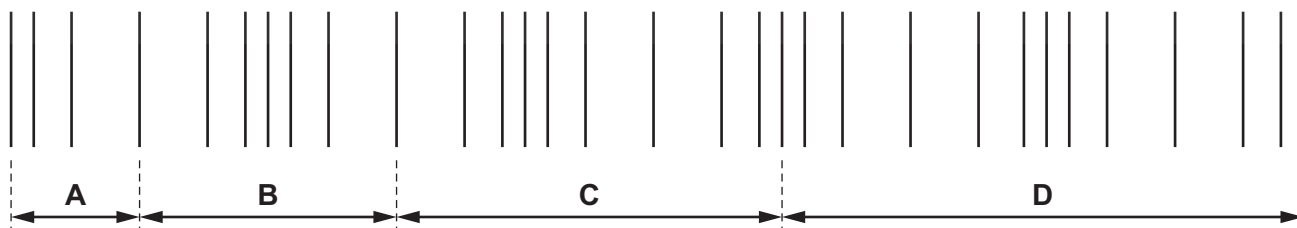
3 A water wave in a ripple tank refracts as it passes from deep water to shallow water.

Which properties change as the wave refracts?

- A frequency and amplitude
- B frequency and wavelength
- C speed and frequency
- D speed and wavelength

4 A sound wave travels through air. The lines in the diagram show the positions of layers of air at one particular time.

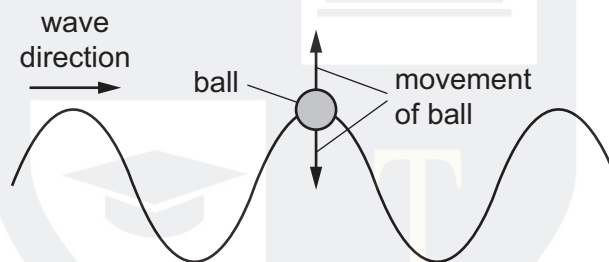
Which distance shows the wavelength of the wave?



- 5 A wave in a ripple tank passes from a deeper to a shallower region and refracts.

Which wave properties decrease as the wave enters the shallow region?

- A frequency only
 - B speed only
 - C frequency and wavelength
 - D speed and wavelength
- 6 A ball floating in a ripple tank begins to move vertically up and down as a wave passes beneath it. The ball does not move horizontally.

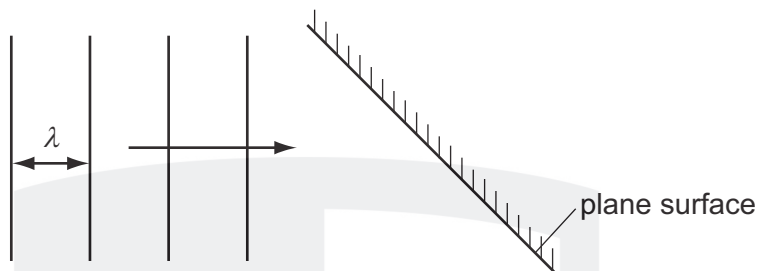


Which statement is correct?

- A Both energy and water are transferred in the wave direction.
- B Energy is not transferred in the wave direction but water is.
- C Energy is transferred in the wave direction but water is not.
- D Neither energy nor water is transferred in the wave direction.

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- 7 In an experiment using a ripple tank, plane wavefronts arrive at a plane surface.



Which row correctly describes the waves after they are reflected from the surface?

	speed of waves	wavelength λ
A	larger	shorter
B	smaller	shorter
C	the same	longer
D	the same	the same

- 8 Which statement is correct?

- A** Infra-red radiation cannot travel in a vacuum.
- B** Infra-red radiation cannot travel in solids or in gases.
- C** Infra-red radiation can only travel in a vacuum.
- D** Infra-red radiation can travel in a vacuum and in gases.

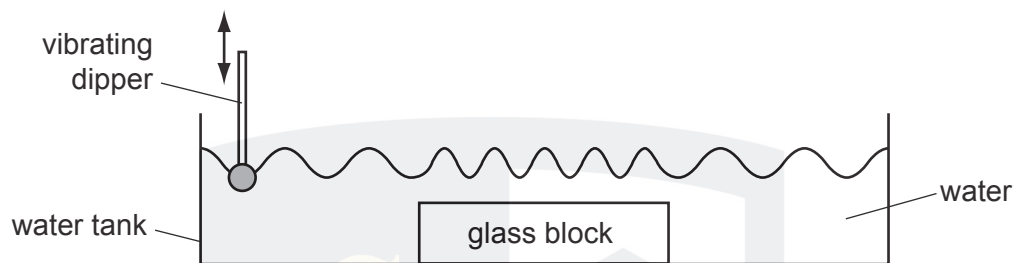
- 9 Water waves refract at a boundary between deep water and shallow water.

What is the effect on the frequency, wavelength and speed of the waves at the boundary?

	frequency	wavelength	speed
A	changes	changes	stays the same
B	changes	stays the same	stays the same
C	stays the same	changes	changes
D	stays the same	stays the same	changes

- 10 What is the frequency of a wave?
- A The number of waves passing a fixed point per second.
 - B The number of peaks added to the number of troughs passing a fixed point per second.
 - C The time taken for one wave to pass a fixed point.
 - D The time taken for the displacement to change from maximum to minimum.
- 11 Which statement is correct for all electromagnetic waves?
- A They are transverse.
 - B They cannot travel in a vacuum.
 - C They have the same frequency.
 - D They travel through lead.
- 12 A wave of frequency 13 000 Hz travels 1300 m in 4.0 s.
- What is the wavelength of the wave?
- A 0.025 m
 - B 0.40 m
 - C 2.5 m
 - D 40 m
- 13 A star explodes in outer space.
- Which waves from the exploding star do **not** reach the Earth?
- A infra-red
 - B light
 - C radio
 - D sound

- 14 A ripple tank is used to show wave behaviour. The dipper vibrates up and down at a constant frequency.



What happens to the frequency and to the speed of the wave as it reaches the glass block?

	frequency	speed
A	decreases	decreases
B	decreases	increases
C	remains the same	decreases
D	remains the same	increases

- 15 A wave has a frequency of 10 kHz.

Which pair of values of its speed and wavelength is possible?

	<u>speed</u> m/s	<u>wavelength</u> m
A	330	0.33
B	330	33
C	3.0×10^8	30
D	3.0×10^8	3.0×10^4

16 Energy can be transferred in many different ways.

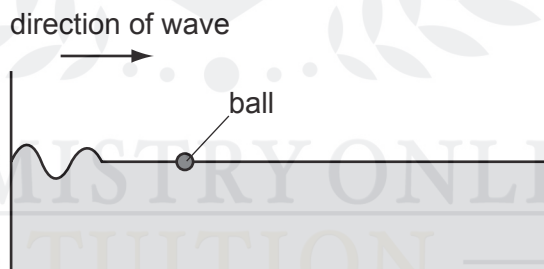
In which situation is energy transferred by wave motion?

- A** colliding atoms in a heated copper rod
- B** fast-moving electrons in a cathode-ray oscilloscope
- C** hot water rising in a heated saucepan
- D** ripples passing across water in a ripple tank

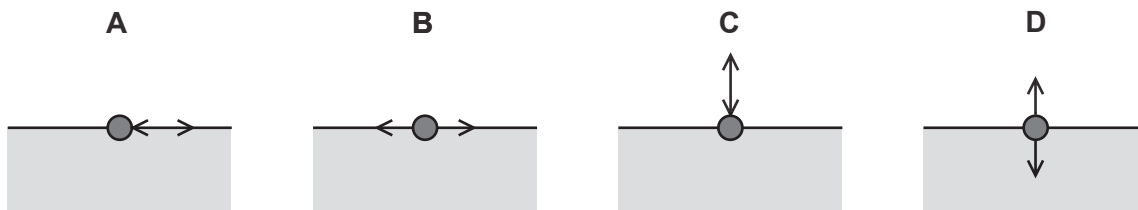
17 Which of the following travels as a longitudinal wave?

- A** a radio wave in air
- B** a sound wave in a solid
- C** a wave on a rope shaken from side to side
- D** an infra-red wave in space

18 The diagram shows a ball floating in a tank of water.



Which diagram shows the movement of the ball as the wave passes?



19 A wave has a frequency of 2 Hz.

How many waves are produced in one minute?

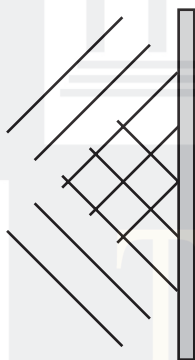
A 2×60

B $\frac{60}{2}$

C 2

D $\frac{2}{60}$

20 The diagram shows the pattern of waves in a ripple tank.



What does the pattern show?

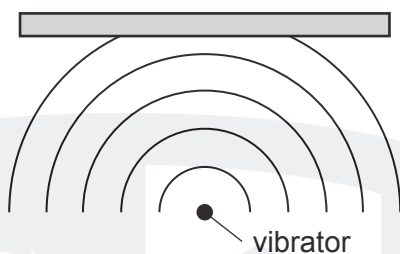
A waves being reflected

B waves being refracted

C waves changing frequency

D waves changing speed

- 21** In a ripple tank, a vibrator produces circular wavefronts which hit a flat surface.



The reflected wavefronts are also parts of circles. Where is the centre of these circles?

A ●

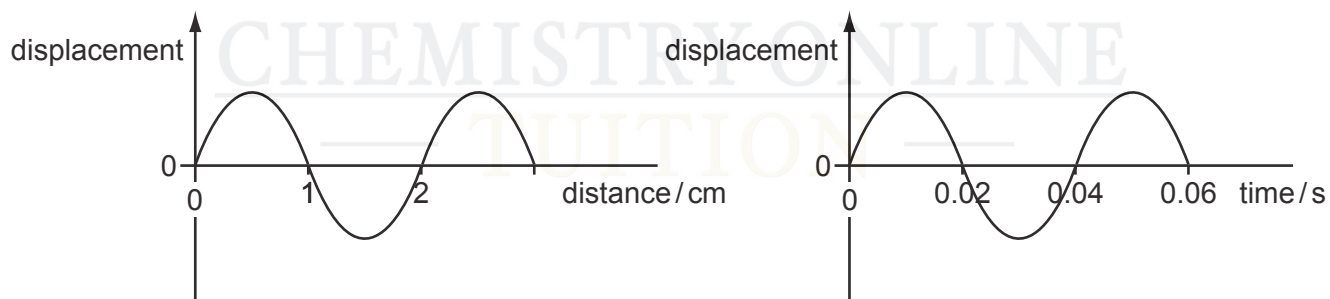
B ●

C ●

D ●

vibrator

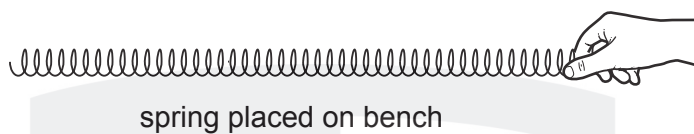
- 22** The displacement-distance and displacement-time graphs are for a water wave in a ripple tank.



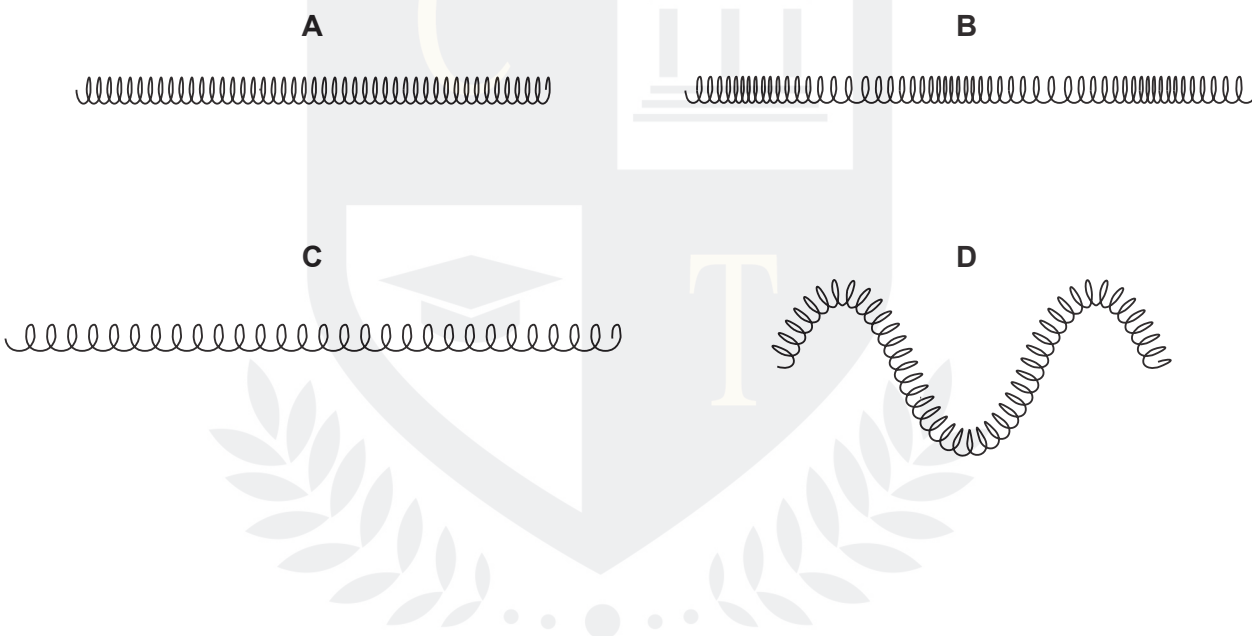
What is the speed of the water wave?

- A** 0.02 cm/s **B** 0.08 cm/s **C** 25 cm/s **D** 50 cm/s

23 A student uses a spring to demonstrate waves. He moves the spring with his hand.



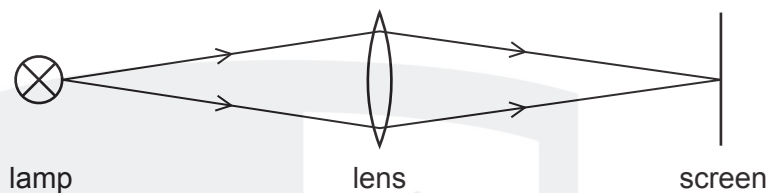
Which diagram demonstrates the type of wave produced by a source of sound?



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24 Which diagram shows an example of a longitudinal wave?

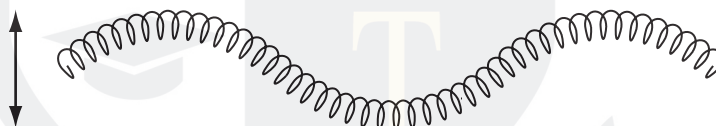
A light travelling from a lamp to a screen



B a spring pushed backwards and forwards



C a spring pushed up and down

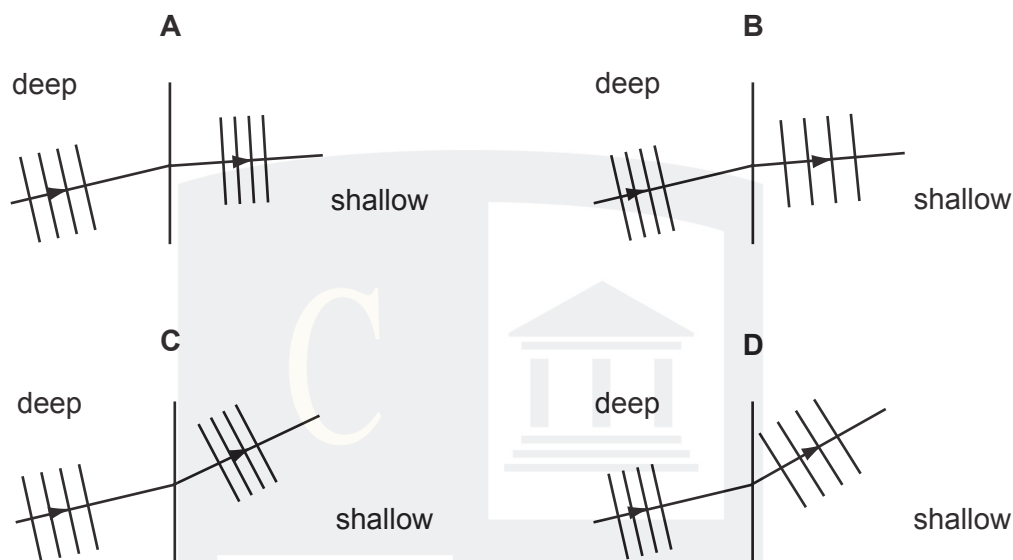


D a water ripple caused by a dipper moving up and down

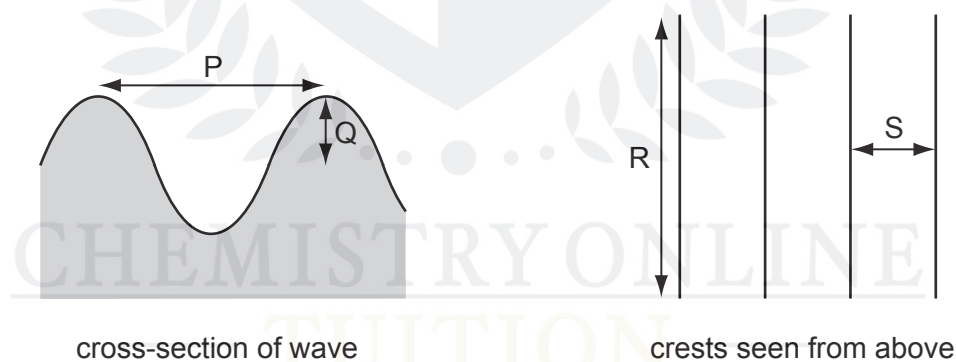


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25 Which diagram correctly represents water waves travelling from deep water to shallow water?



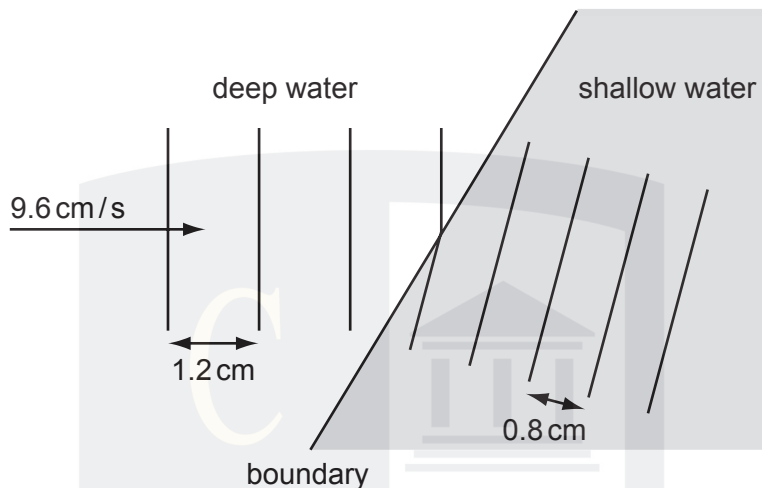
26 The diagrams show different views of a water wave in a ripple tank.



Which letters represent a wavelength and a wavefront?

	wavelength	wavefront
A	P	R
B	P	S
C	Q	R
D	Q	S

- 27 A ripple tank is used to demonstrate refraction of plane water waves.



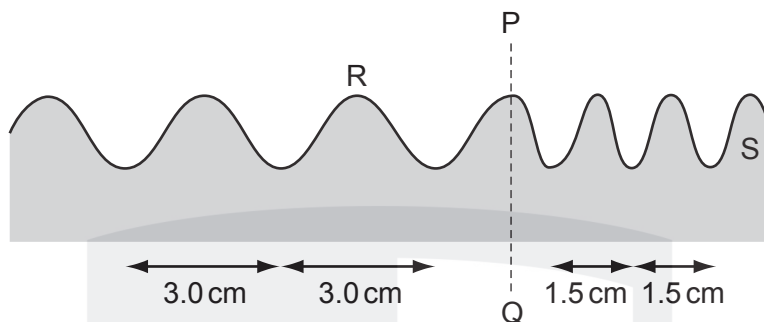
Waves in deep water have a wavelength of 1.2 cm and a speed of 9.6 cm/s. The wavelength of the waves in shallow water is 0.8 cm.

What is the speed of the waves in the shallow water?

- A** 6.4 cm/s **B** 8.0 cm/s **C** 9.6 cm/s **D** 14.4 cm/s
- 28 When ice melts to become water, which force must be overcome?
- A** the attraction between electrons and the nucleus
B the attraction between the atoms in a molecule
C the force between molecules
D the force of gravity
- 29 Which factors increase the rate of evaporation of a liquid?

	increasing its temperature	increasing its surface area	increasing its depth
A	yes	yes	yes
B	yes	yes	no
C	yes	no	yes
D	no	yes	yes

30 The diagram shows a water wave in a ripple tank.



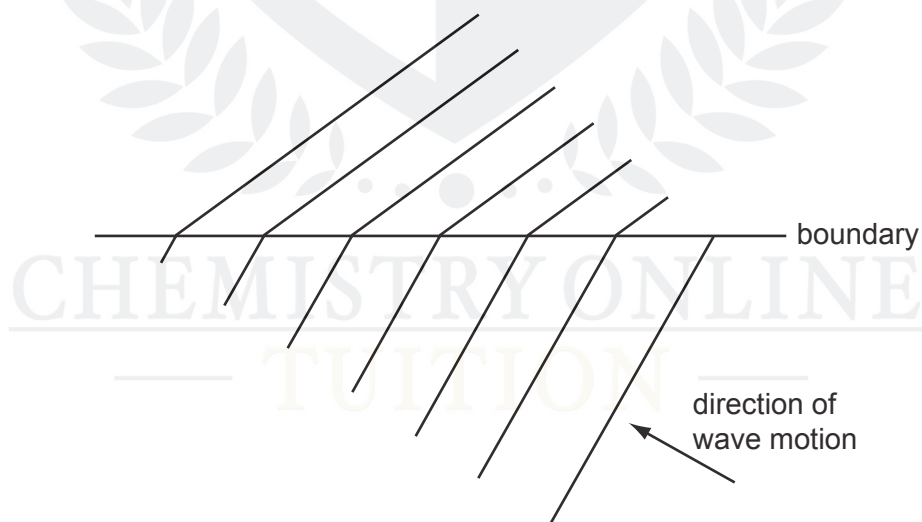
The wave has a speed of 12 cm/s at R.

The wave crosses a boundary PQ where the distance between crests changes from 3.0 cm to 1.5 cm.

What is the speed of the wave at S?

- A** 3.0 cm/s **B** 6.0 cm/s **C** 12 cm/s **D** 24 cm/s

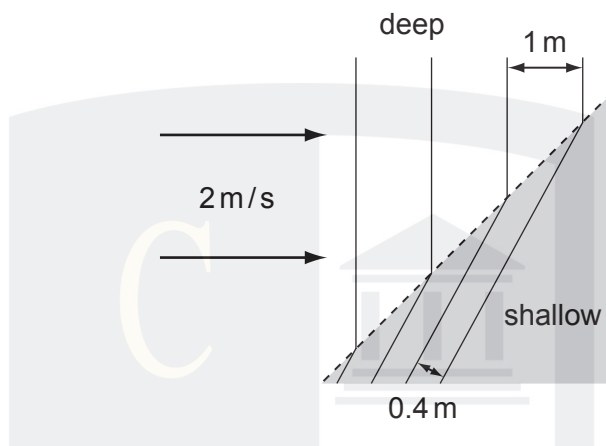
31 The diagram shows the refraction of water waves as they cross a boundary in a ripple tank.



What causes this refraction?

- A** a change in frequency due to a change in depth
B a change in frequency due to a change in wavelength
C a change in speed due to a change in depth
D a change in speed due to a change in frequency

32 Waves pass from deep water to shallow water and refraction occurs.



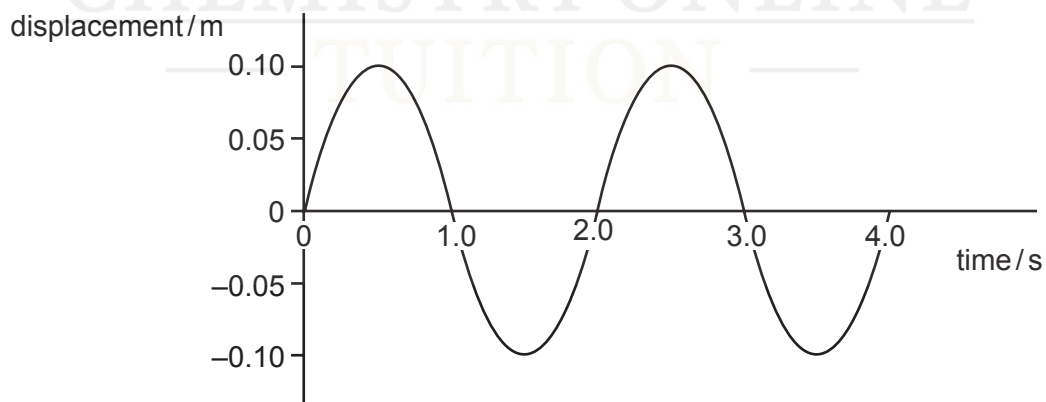
What is the speed of the waves in the shallow water?

- A** 0.2 m/s **B** 0.8 m/s **C** 2.0 m/s **D** 5.0 m/s

33 What is meant by the term *wavefront*?

- A** the distance between successive peaks of a wave
B the distance between the trough and the peak of a wave
C a line joining points along the peak of a wave
D a line joining the trough and the peak of a wave

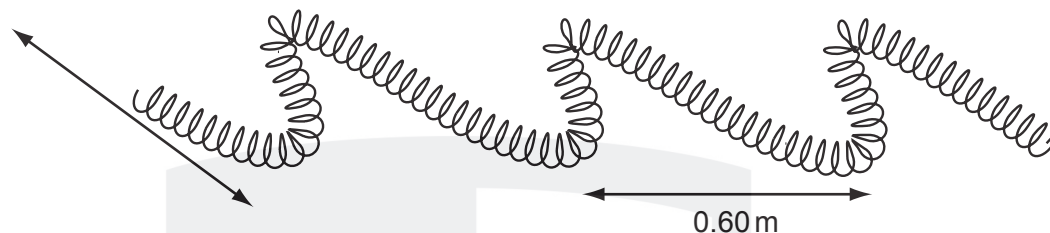
34 The diagram shows how displacement varies with time as a wave passes a fixed point.



What is the frequency of this wave?

- A** 0.25 Hz **B** 0.50 Hz **C** 1.0 Hz **D** 2.0 Hz

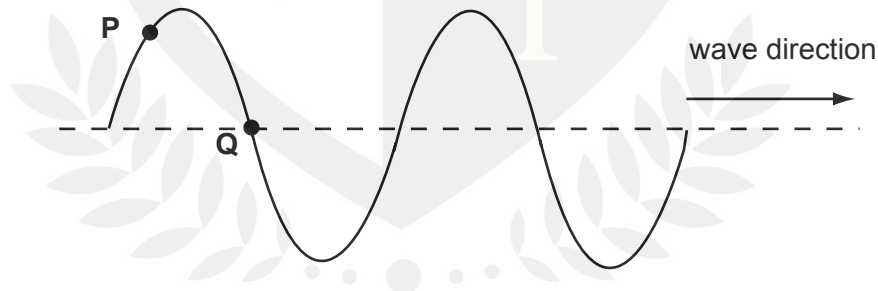
- 35 The diagram shows part of a spring that is shaken from side to side to produce a wave.



The distance between successive peaks is 0.60 m and the frequency is 2.5 Hz.

How long does it take for a wave to travel 3.0 m along the spring?

- A** 0.20 s **B** 0.50 s **C** 2.0 s **D** 5.0 s
- 36 The diagram shows a wave on a string with two points **P** and **Q** marked. The wave is moving in the direction shown.

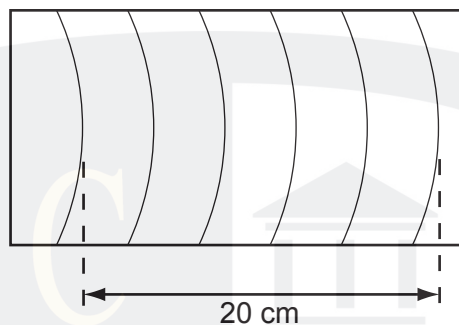


What will happen next?

- A** P will move to the right.
B P will move up.
C Q will not move.
D Q will move up.

- 37 The dipper in a ripple tank vibrates at a frequency of 4.0 Hz and the resulting wave pattern is photographed.

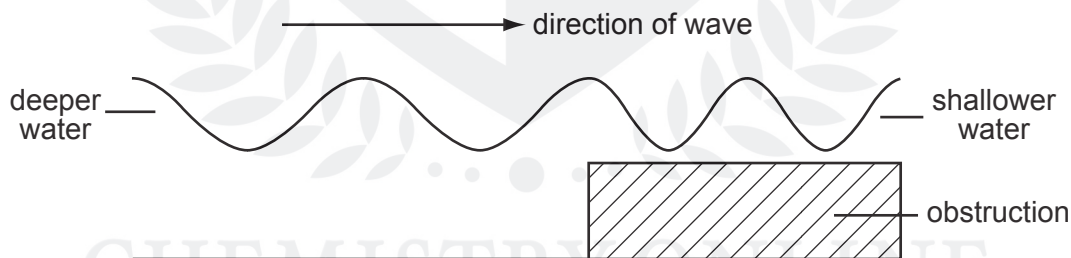
The distance between the two crests shown is 20 cm.



What is the speed of the wave?

- A** 4 cm/s **B** 5 cm/s **C** 16 cm/s **D** 20 cm/s

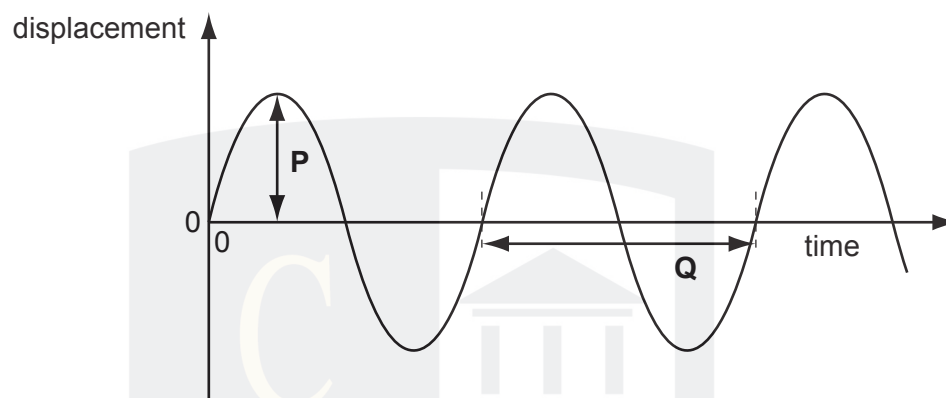
- 38 The diagram shows a wave moving into shallower water.



The wavelength of the waves is reduced because

- A** both the frequency and the speed decrease.
B both the frequency and the speed increase.
C only the frequency increases.
D only the speed decreases.

39 The diagram shows a graph of wave motion.



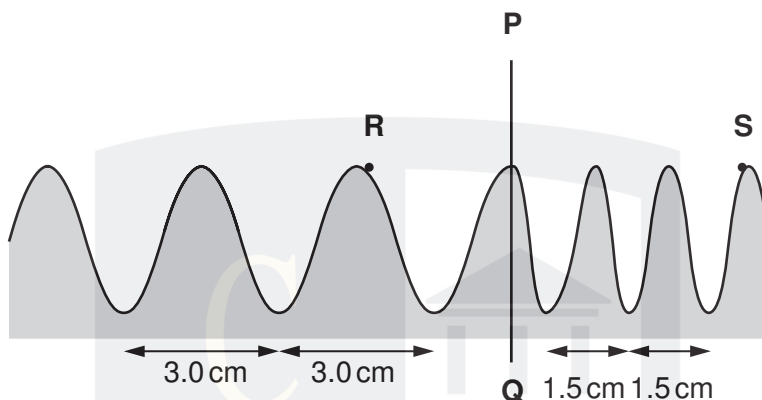
Which quantities are shown by distances **P** and **Q**?

	P	Q
A	amplitude	period
B	amplitude	wavelength
C	half the amplitude	period
D	half the amplitude	wavelength

40 Which of the following is an example of a transverse and a longitudinal wave?

	transverse wave	longitudinal wave
A	light	water ripples
B	radio	sound
C	sound	light
D	water ripples	radio

- 41 The diagram shows a water wave in a ripple tank.



The wave has a speed of 12 cm/s at **R**.

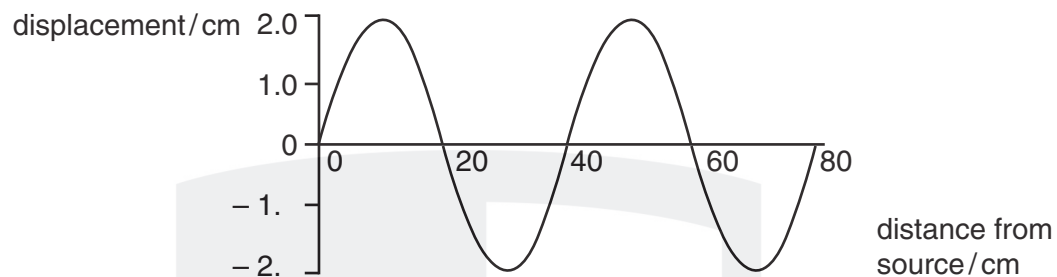
The wave crosses a boundary **PQ** where the distance between crests changes from 3.0 cm to 1.5 cm.

What is the velocity of the wave at point **S**?

- A** 3.0 cm/s
- B** 6.0 cm/s
- C** 12 cm/s
- D** 24 cm/s

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42 The diagram shows the variation of the displacement of a wave with distance from the source.



What is the amplitude of the wave?

- A** 2.0 cm
- B** 4.0 cm
- C** 20 cm
- D** 40 cm

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