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:

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

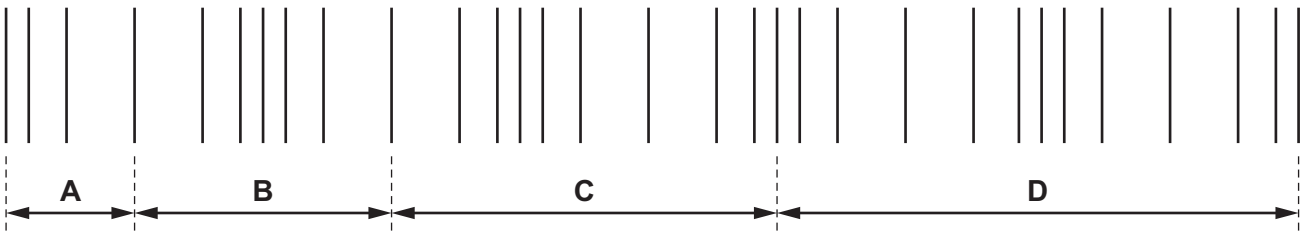
B frequency and wavelength

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?

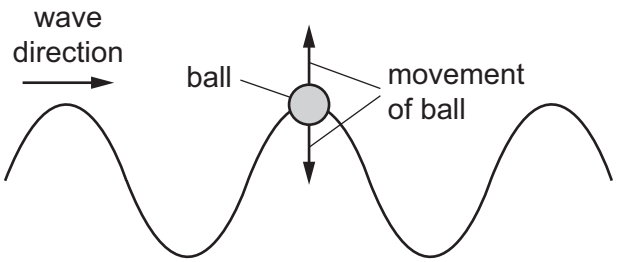
A frequency only

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?

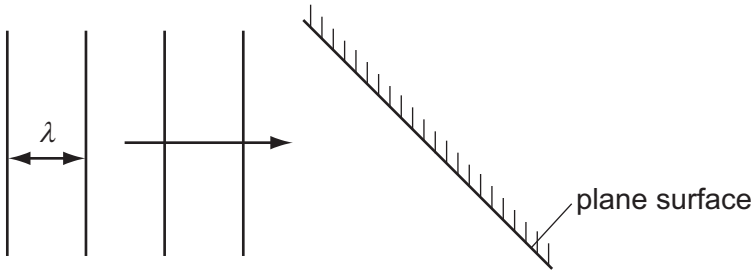
A Both energy and water are transferred in the wave direction.

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.

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?

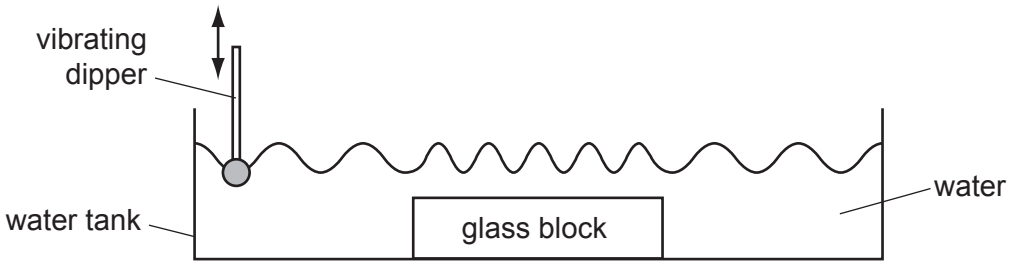
A infra-red

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?

	$\frac{\text{speed}}{\text{m/s}}$	$\frac{\text{wavelength}}{\text{m}}$
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?

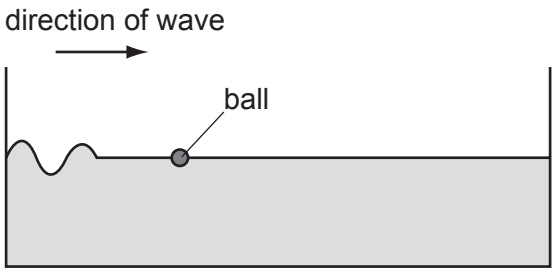
A a radio wave in air

B a sound wave in a solid

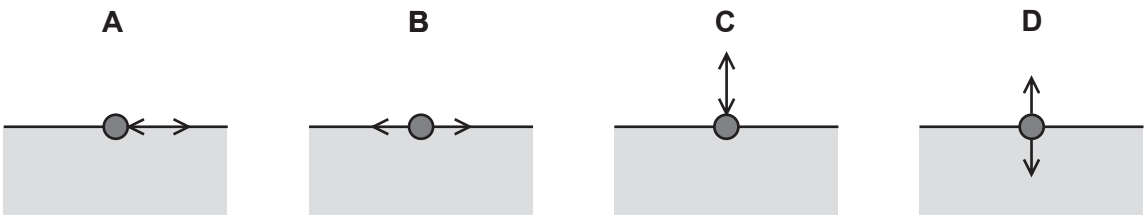
C a wave on a rope shaken from side to side

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?

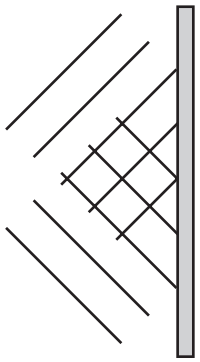


19 A wave has a frequency of 2 Hz.

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?

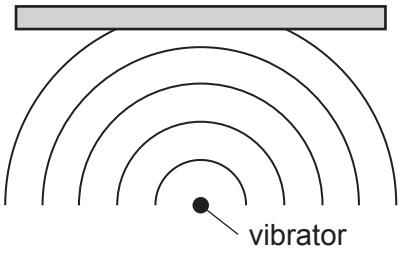
A waves being reflected

B waves being refracted

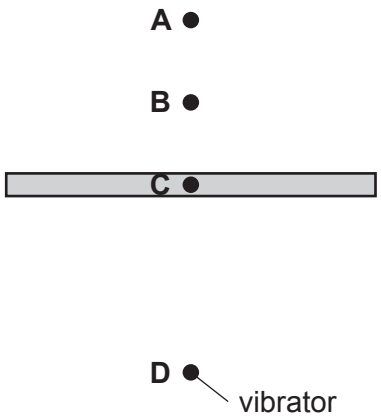
C waves changing frequency

D waves changing speed

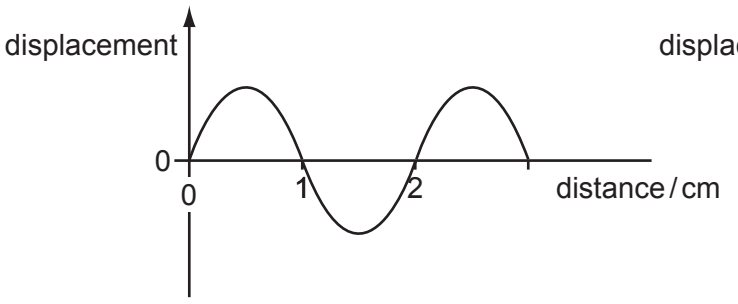
21 In a ripple tank, a vibrator produces circular wavefronts which hit a flat surface.

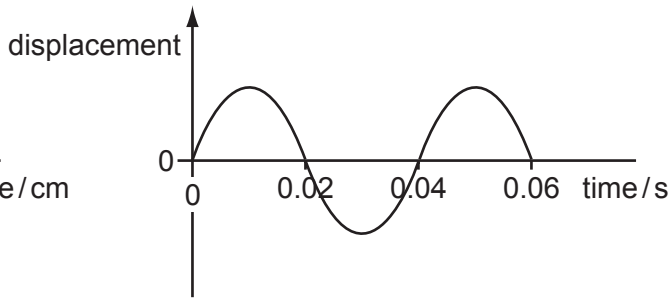


The reflected wavefronts are also parts of circles. Where is the centre of these circles?



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

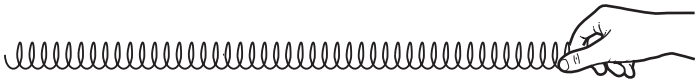




What is the speed of the water wave?

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.



spring placed on bench

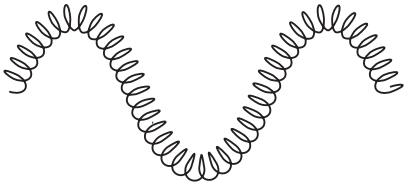
Which diagram demonstrates the type of wave produced by a source of sound?

A

B

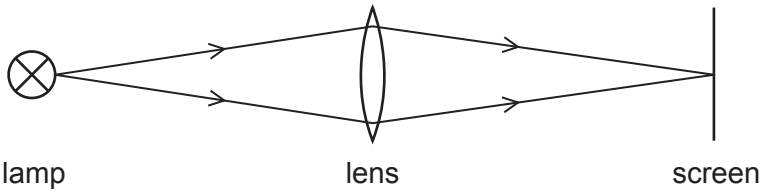
C

D



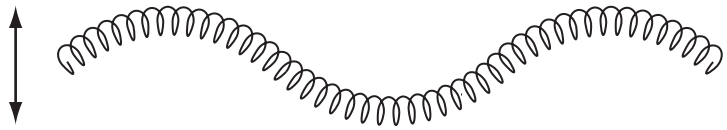
24 Which diagram shows an example of a longitudinal wave?

A light travelling from a lamp to a screen



B a spring pushed backwards and forwards

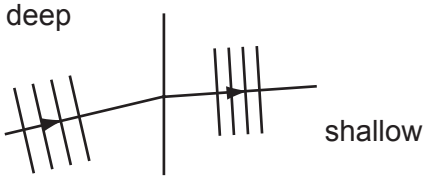
C a spring pushed up and down



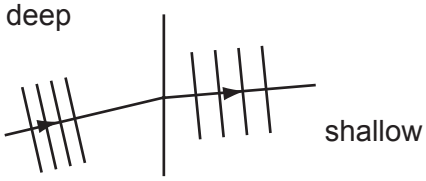
D a water ripple caused by a dipper moving up and down

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

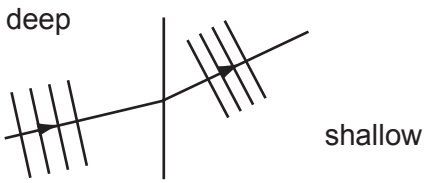
A



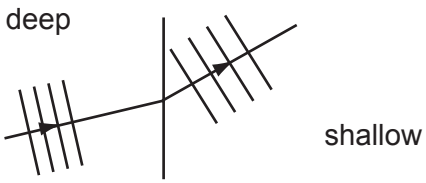
B



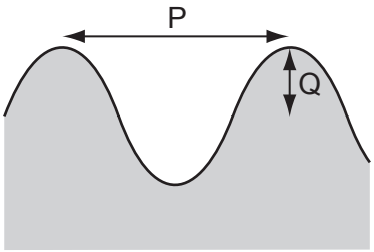
C



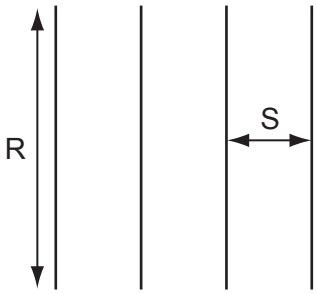
D



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



cross-section of wave

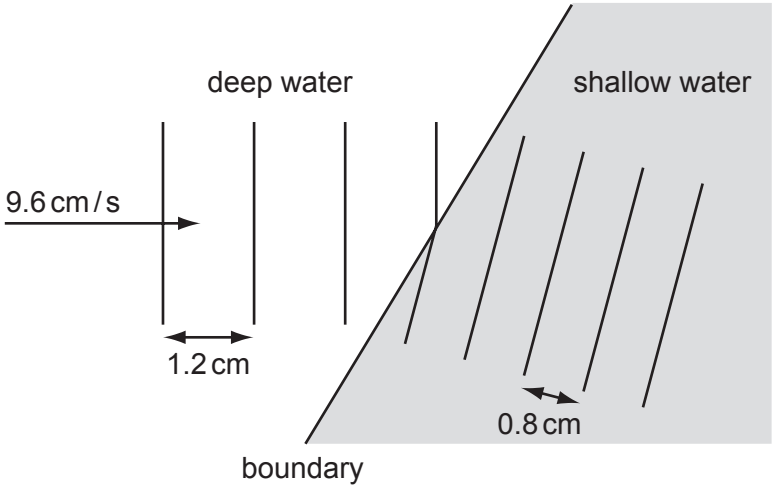


crests seen from above

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

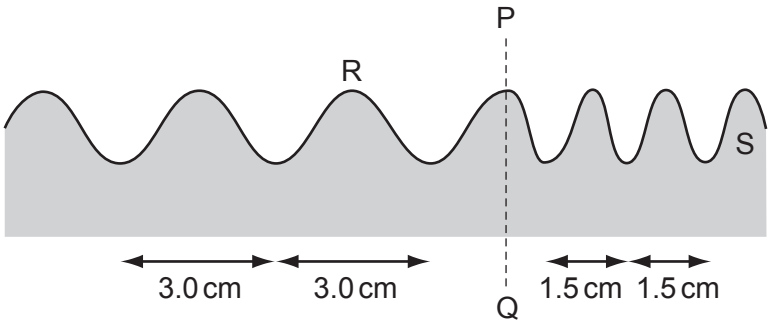
C the force between molecules

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.



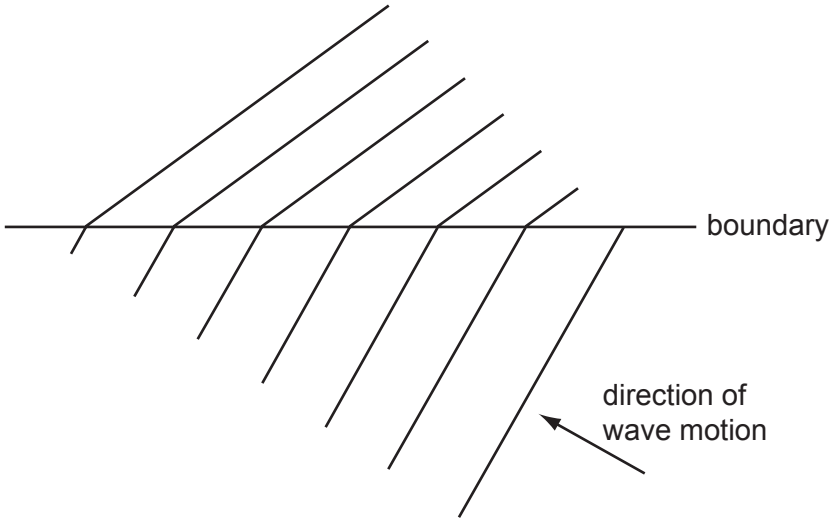
The wave has a speed of 12 cm / s at R.

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?

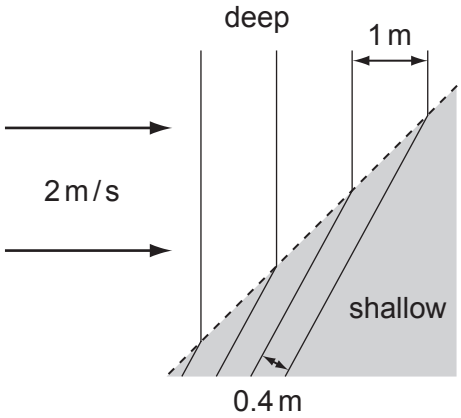
A a change in frequency due to a change in depth

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*?

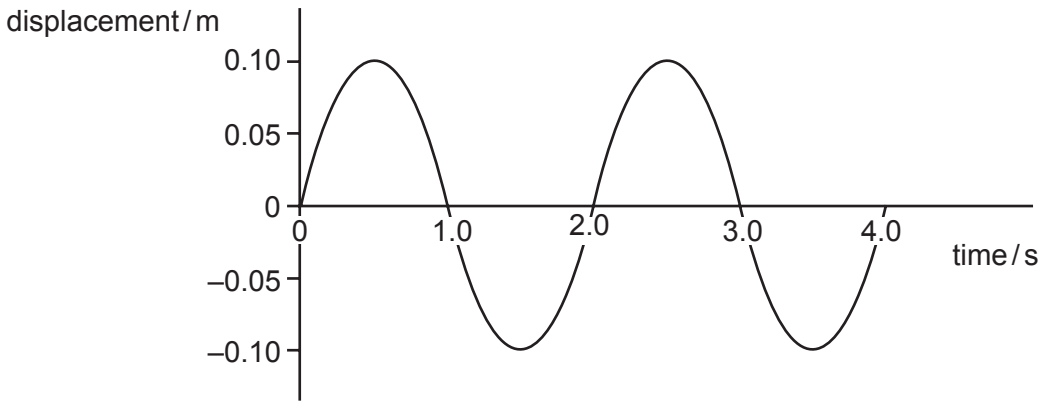
A the distance between successive peaks of a wave

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

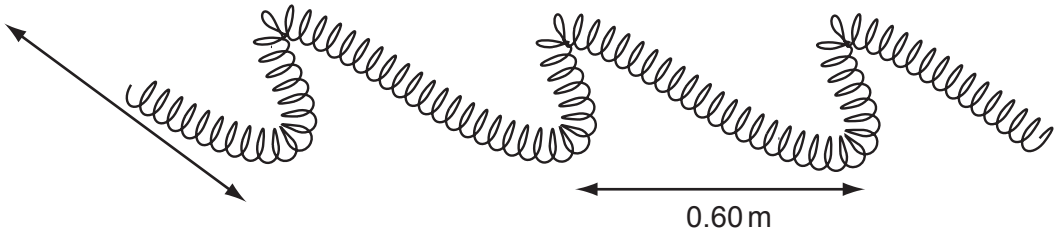
34 The diagram shows how displacement varies with time as a wave passes a fixed point.



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.

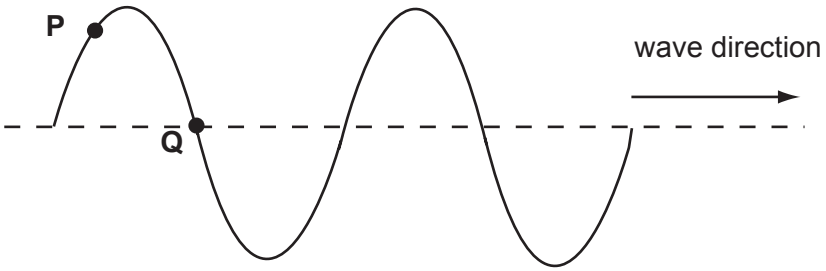


The distance between successive peaks is 0.60 m and the frequency is 2.5 Hz.

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.

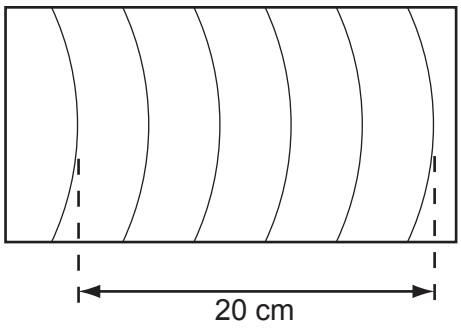
B **P** will move up.

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.

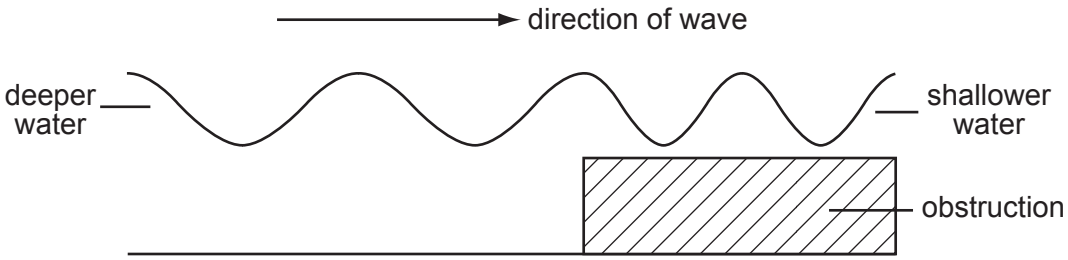
The distance between the two crests shown is 20 cm.



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

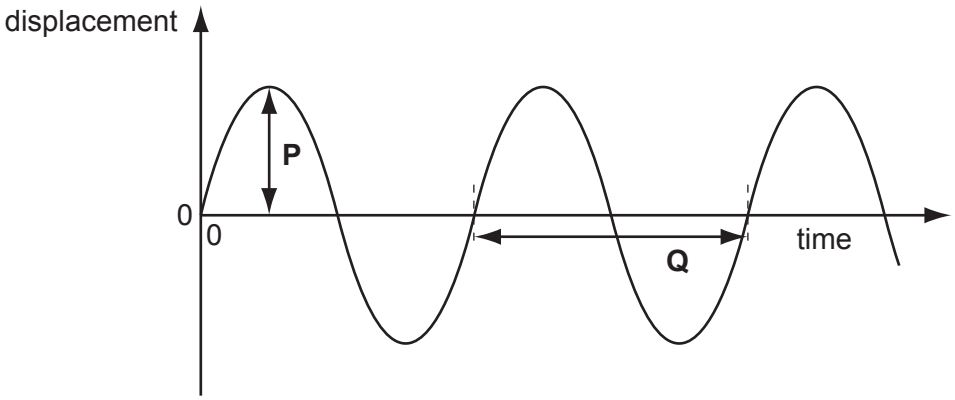
A both the frequency and the speed decrease.

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.



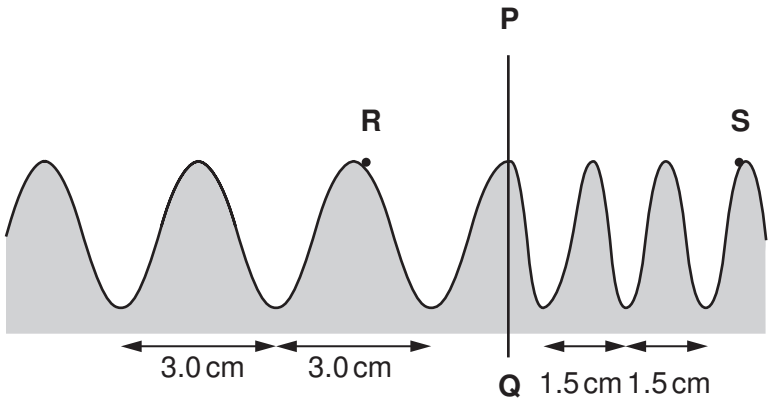
Which quantities are shown by distances **P** and **Q**?

	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**?

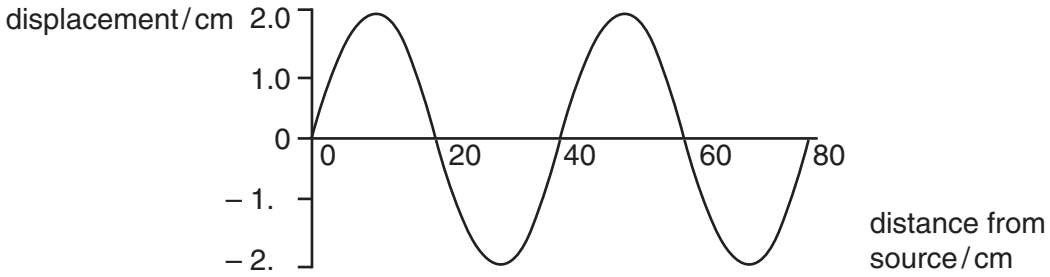
A 3.0 cm/s

B 6.0 cm/s

C 12 cm/s

D 24 cm/s

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