

# 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.

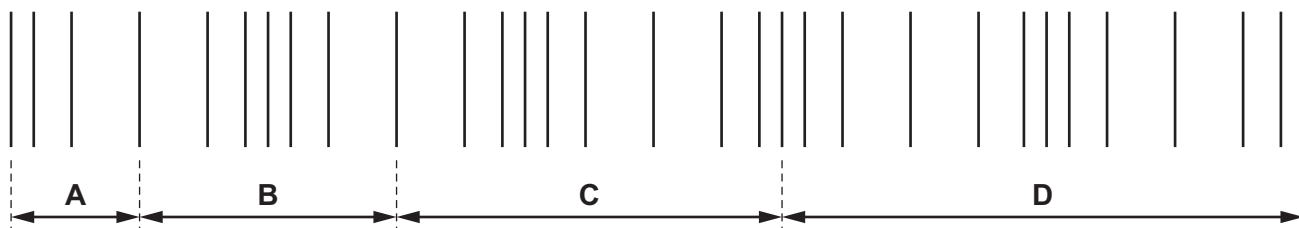
The diagram shows the positions of the coils at one particular time.



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.

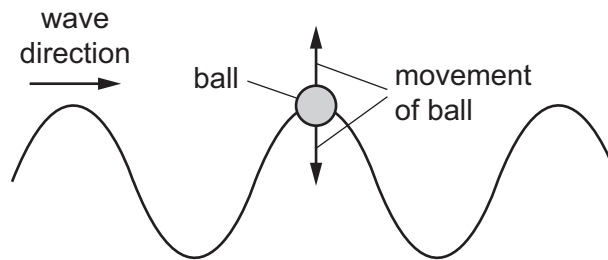
Which distance shows the wavelength of the wave?



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?

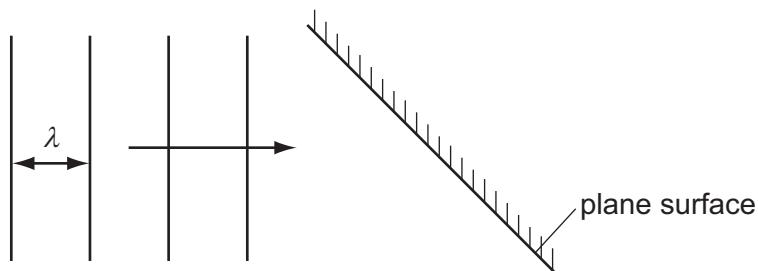
- A frequency only
  - B speed only
  - C frequency and wavelength
  - D speed and wavelength
- 6 A ball floating in a ripple tank begins to move vertically up and down as a wave passes beneath it. The ball does not move horizontally.



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 $\lambda$
<b>A</b>	larger	shorter
<b>B</b>	smaller	shorter
<b>C</b>	the same	longer
<b>D</b>	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.

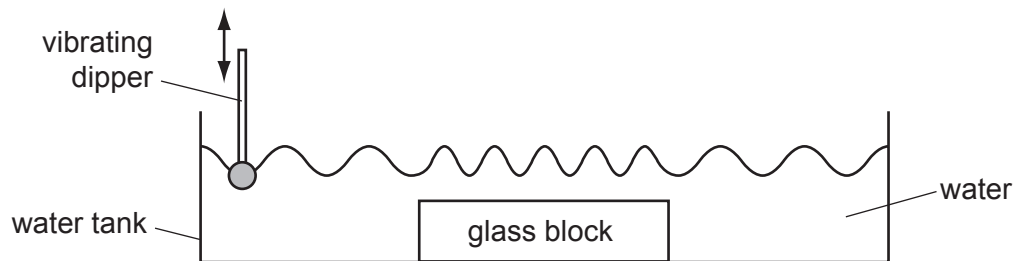
9 Water waves refract at a boundary between deep water and shallow water.

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

	frequency	wavelength	speed
<b>A</b>	changes	changes	stays the same
<b>B</b>	changes	stays the same	stays the same
<b>C</b>	stays the same	changes	changes
<b>D</b>	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 13000 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
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	remains the same	decreases
<b>D</b>	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
<b>A</b>	330	0.33
<b>B</b>	330	33
<b>C</b>	$3.0 \times 10^8$	30
<b>D</b>	$3.0 \times 10^8$	$3.0 \times 10^4$

16 Energy can be transferred in many different ways.

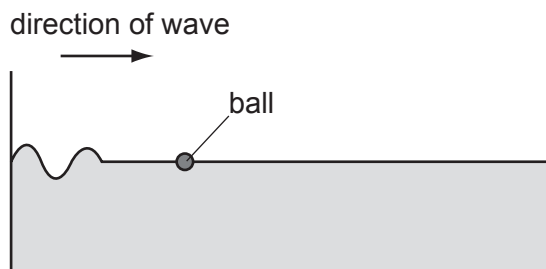
In which situation is energy transferred by wave motion?

- 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

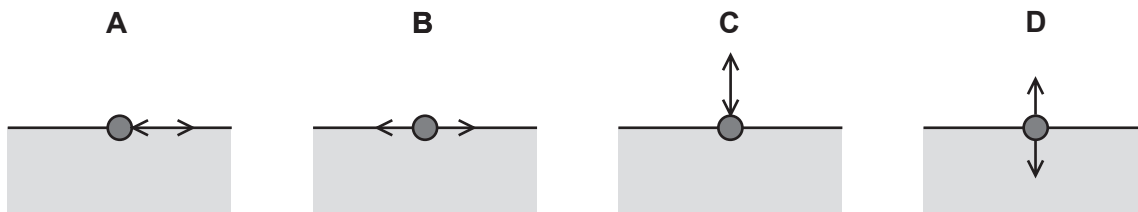
17 Which of the following travels as a longitudinal wave?

- 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?

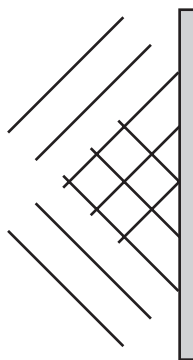
**A**  $2 \times 60$

**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

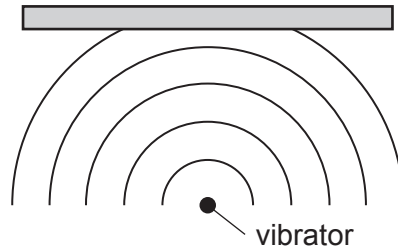
**B** waves being refracted

**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?

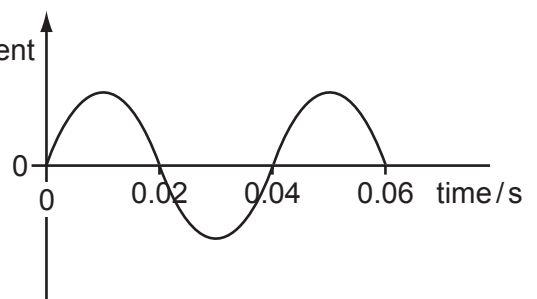
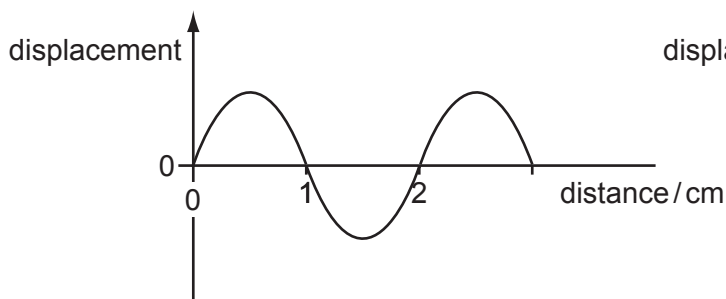
A ●

B ●



D ● vibrator

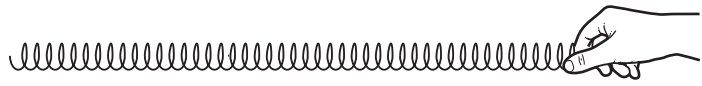
22 The displacement-distance and displacement-time graphs are for a water wave in a ripple tank.



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.



spring placed on bench

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

A



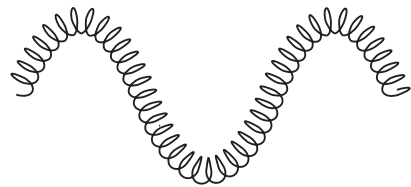
B



C

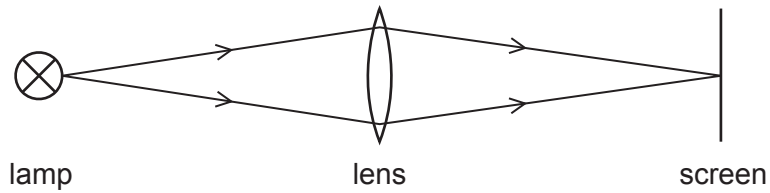


D



24 Which diagram shows an example of a longitudinal wave?

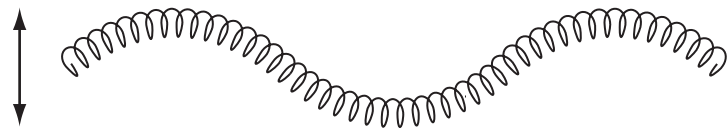
A light travelling from a lamp to a screen



B a spring pushed backwards and forwards



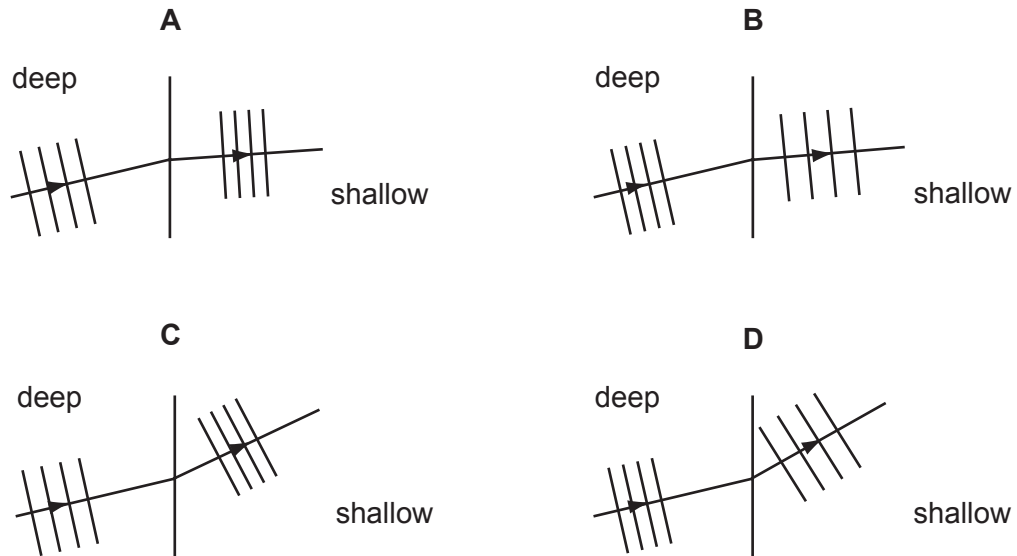
C a spring pushed up and down



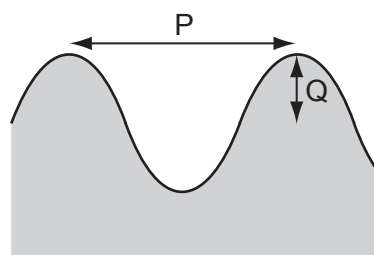
D a water ripple caused by a dipper moving up and down



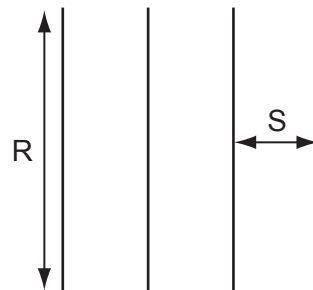
25 Which diagram correctly represents water waves travelling from deep water to shallow water?



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



cross-section of wave

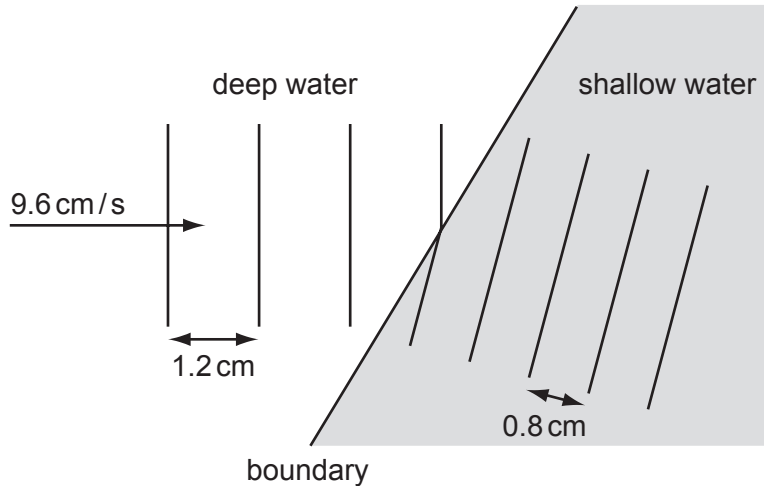


crests seen from above

Which letters represent a wavelength and a wavefront?

	wavelength	wavefront
<b>A</b>	P	R
<b>B</b>	P	S
<b>C</b>	Q	R
<b>D</b>	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

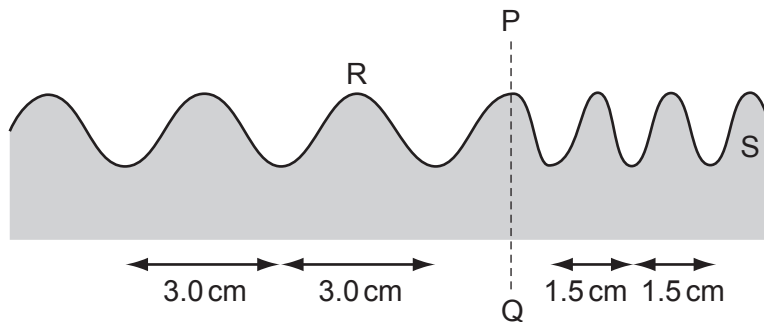
28 When ice melts to become water, which force must be overcome?

- 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
<b>A</b>	yes	yes	yes
<b>B</b>	yes	yes	no
<b>C</b>	yes	no	yes
<b>D</b>	no	yes	yes

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



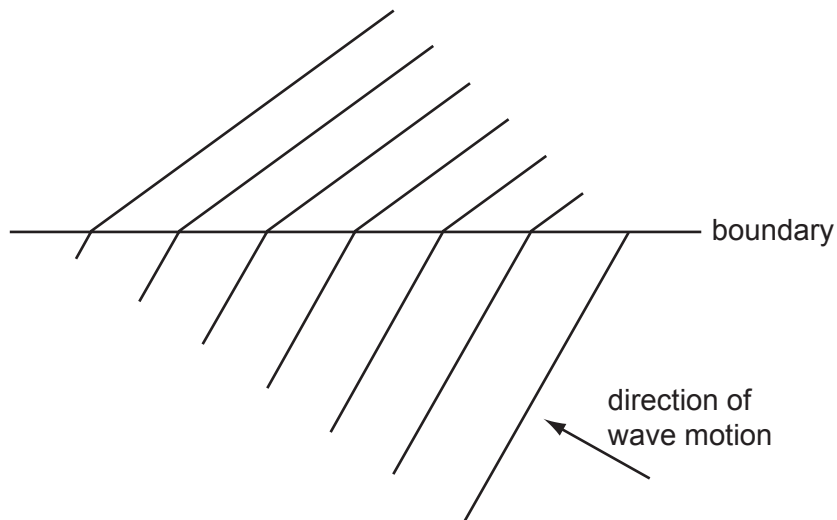
The wave has a speed of 12 cm/s at R.

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

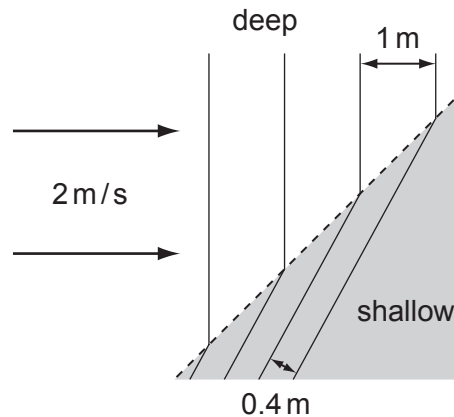
31 The diagram shows the refraction of water waves as they cross a boundary in a ripple tank.



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.



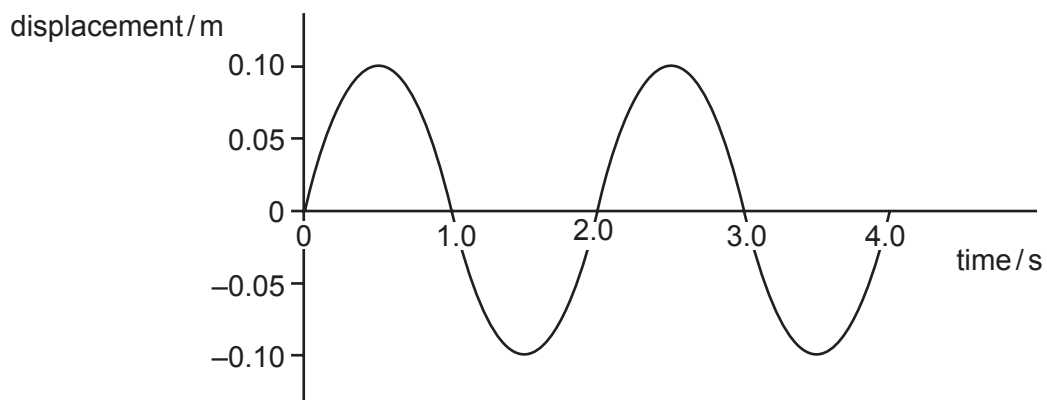
What is the speed of the waves in the shallow water?

- 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

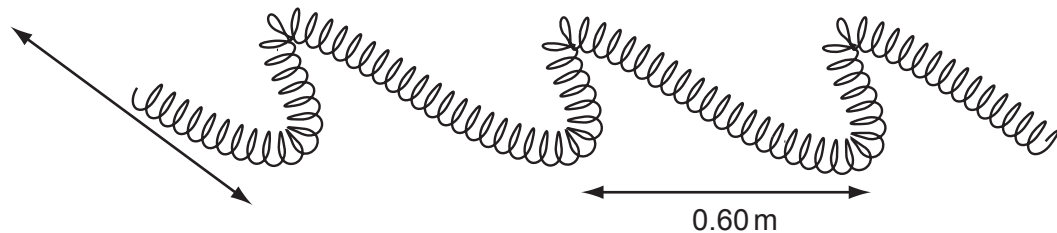
34 The diagram shows how displacement varies with time as a wave passes a fixed point.



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.

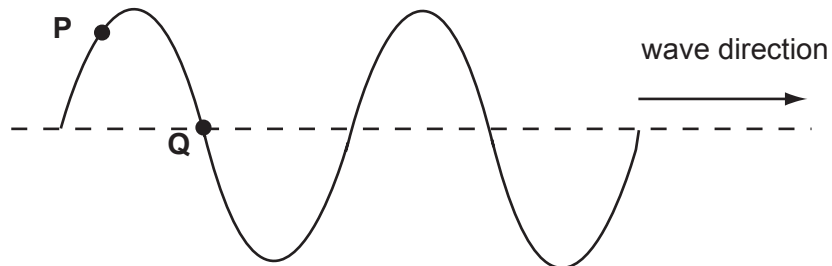


The distance between successive peaks is 0.60 m and the frequency is 2.5 Hz.

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.



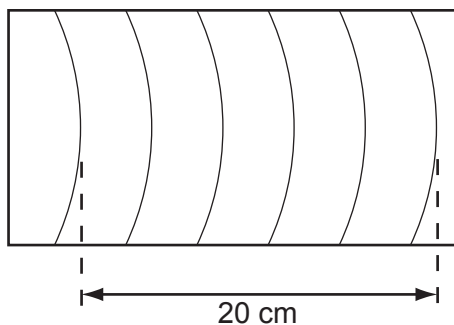
What will happen next?

- 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.

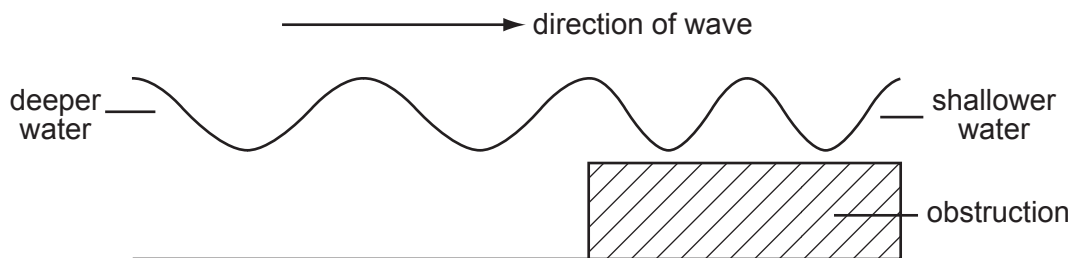
The distance between the two crests shown is 20 cm.



What is the speed of the wave?

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

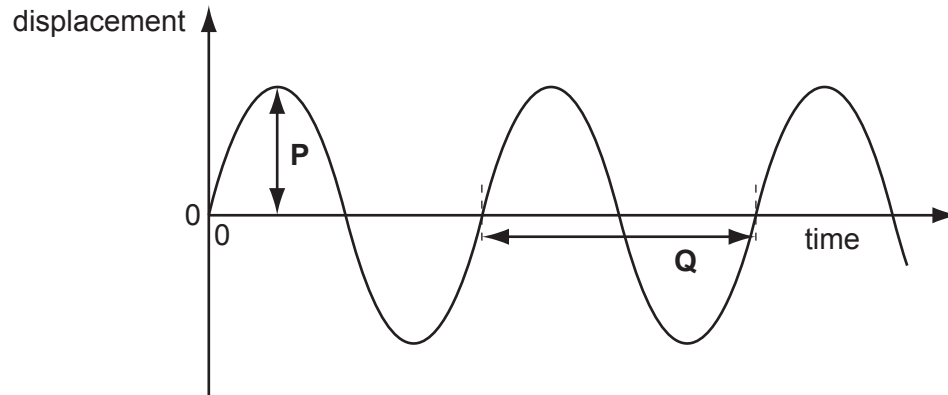
38 The diagram shows a wave moving into shallower water.



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.



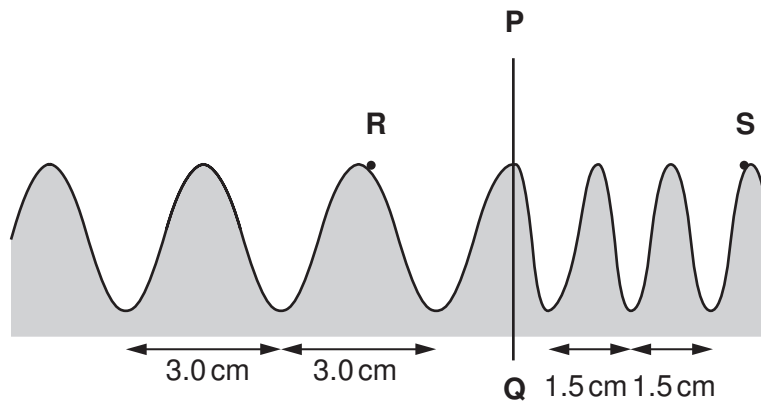
Which quantities are shown by distances **P** and **Q**?

	<b>P</b>	<b>Q</b>
<b>A</b>	amplitude	period
<b>B</b>	amplitude	wavelength
<b>C</b>	half the amplitude	period
<b>D</b>	half the amplitude	wavelength

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

	transverse wave	longitudinal wave
<b>A</b>	light	water ripples
<b>B</b>	radio	sound
<b>C</b>	sound	light
<b>D</b>	water ripples	radio

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



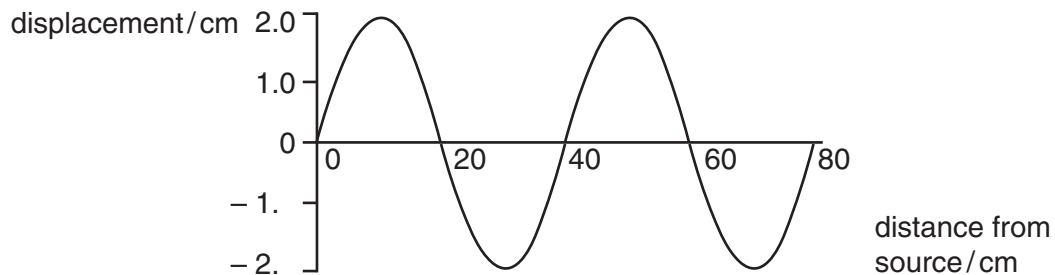
The wave has a speed of 12 cm/s at **R**.

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