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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

General Wave Properties

Paper 1 — Multiple-Choice Questions (topical compilation)

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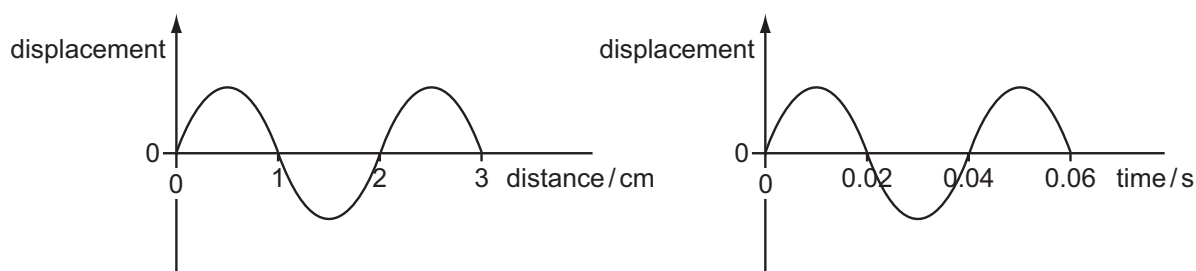
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3.1 General wave properties

PAPER 1

- 1 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

5054/11/M/J/11/Q20

- 2 The speed of radio waves is c . A radio station transmits waves with a wavelength λ .

What is the frequency of the transmission?

- A** $\frac{c}{\lambda}$ **B** $\frac{\lambda}{c}$ **C** $\frac{1}{\lambda}$ **D** $c\lambda$

5054/11/M/J/12/Q21

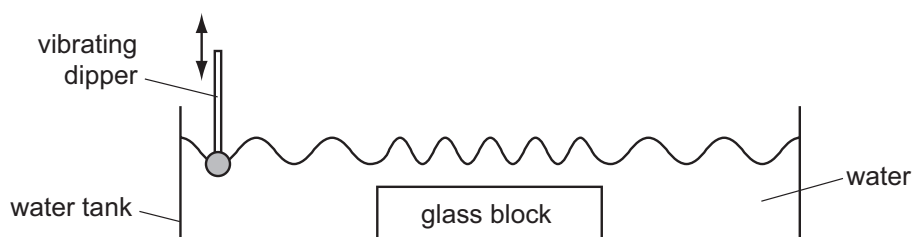
- 3 A wave has a frequency of 2 Hz.

How many waves are produced in one minute?

- A** 2×60 **B** $\frac{60}{2}$ **C** 2 **D** $\frac{2}{60}$

5054/12/M/J/12/Q21

- 4 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

5054/11/M/J/13/Q17

- 5 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

5054/11/M/J/13/Q18

- 6 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

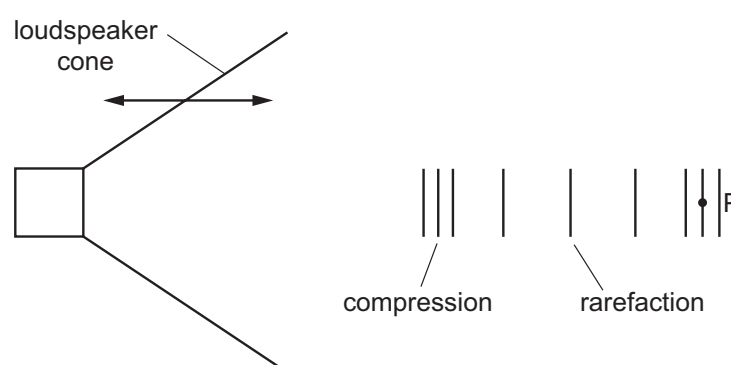
5054/12/M/J/13/Q22

7 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

5054/12/M/J/13/Q24

8 Compressions and rarefactions are sent out from a loudspeaker cone as it vibrates backwards and forwards. The frequency of vibration is 50 Hz.



A compression is at point P. How much time elapses before the next rarefaction arrives at P?

- A 0.010 s
- B 0.020 s
- C 25 s
- D 50 s

5054/11/M/J/14 /Q22

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

5054/11/M/J/14 /Q23

- 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.

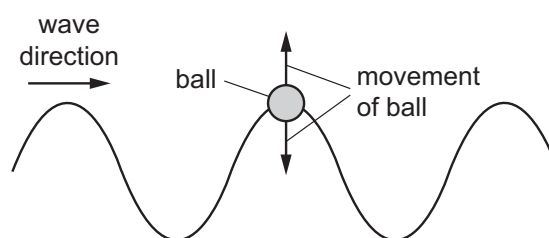
5054/12/M/J/14/Q25

- 11 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

5054/11/M/J/15/Q21

- 12 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.

5054/12/M/J/15/Q24

- 13** 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

5054/11/M/J/16 /Q19

- 14** 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

5054/11/M/J/16 /Q20

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

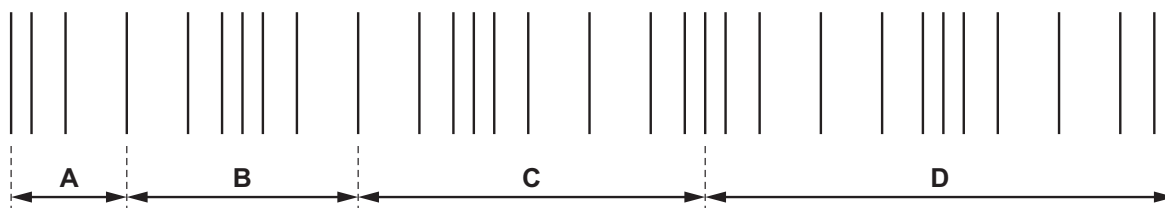
Which properties change as the wave refracts?

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

5054/12/M/J/16 /Q17

- 16** 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?

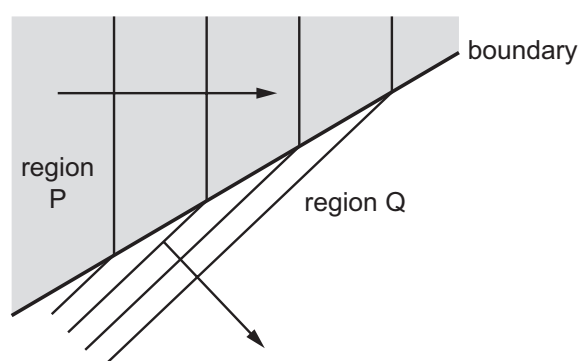


5054/12/M/J/16/Q22

- 17 Which waves are longitudinal?
- A sound waves in water
 - B ultra-violet waves in air
 - C waves on the surface of water
 - D X-rays in a vacuum

5054/11/M/J/17/Q26

- 18 The diagram shows a water wave in a ripple tank being refracted at the boundary between region P and region Q.

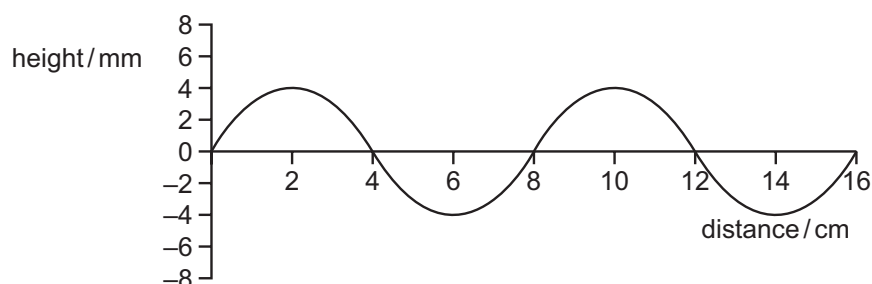


How does the wave in region P compare with the wave in region Q?

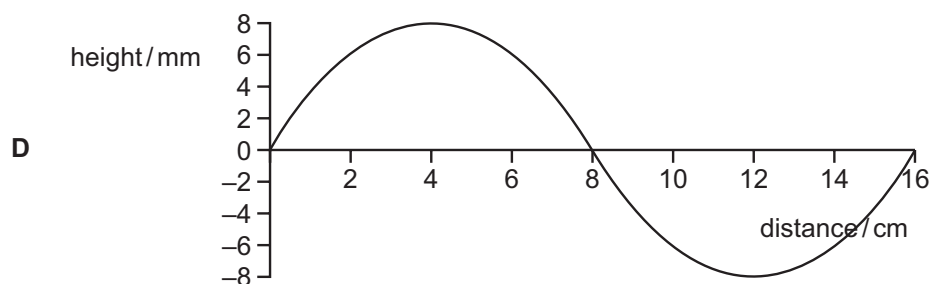
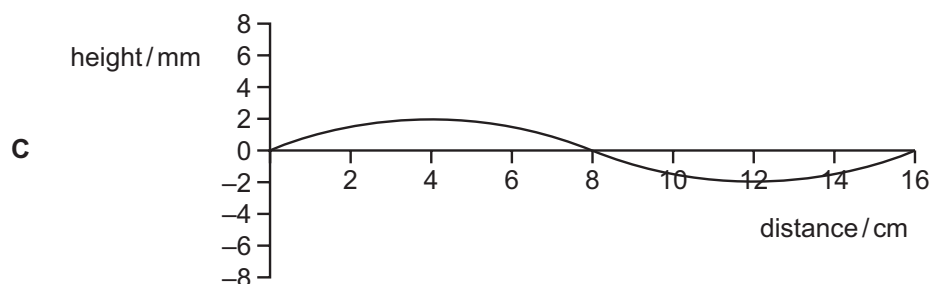
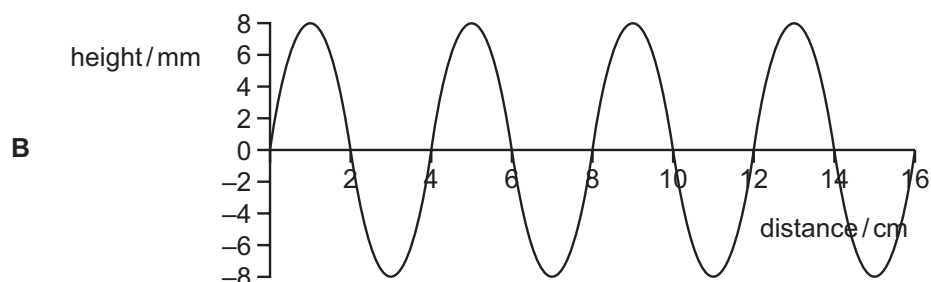
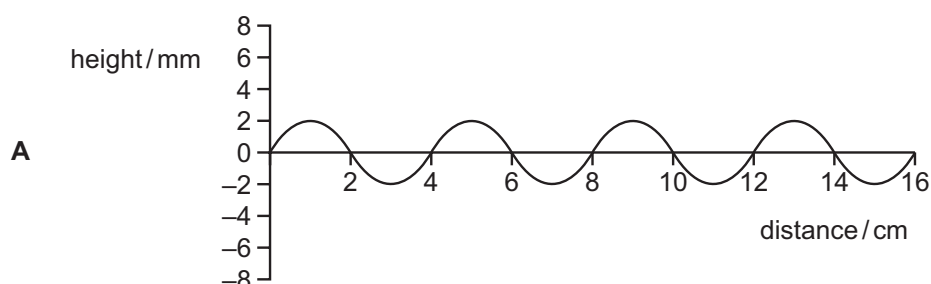
	wavelength of wave in region P	speed of wave in region P
A	larger	faster
B	larger	slower
C	smaller	faster
D	smaller	slower

5054/12/M/J/17/Q26

- 19 The graph shows how the height of a water wave varies with distance along the wave.



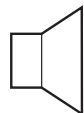
Which graph shows a wave with twice the amplitude, half the frequency, and the same speed?



5054/12/M/J/17/Q27

- 20 The diagram shows a loudspeaker that is producing a continuous sound wave of frequency 200 Hz in air.

loudspeaker



P

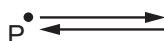
Which diagram best shows how the sound wave causes a molecule at P to move during $\frac{1}{200}$ s ?

A

B

C

D



5054/11/M/J/18/Q26

- 21 A communications system uses microwaves with a wavelength of 15 cm. The speed of light is 3.0×10^8 m/s.

What is the frequency of the microwaves?

- A 2.0×10^7 Hz B 4.5×10^7 Hz C 2.0×10^9 Hz D 4.5×10^9 Hz

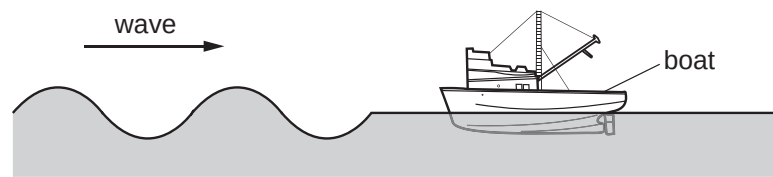
5054/12/M/J/18/Q26

- 22 Which waves are longitudinal?

- A gamma rays
B light waves
C ultrasound waves
D X-rays

5054/11/M/J/19/Q23

- 23** A wave on water travels towards a stationary boat.



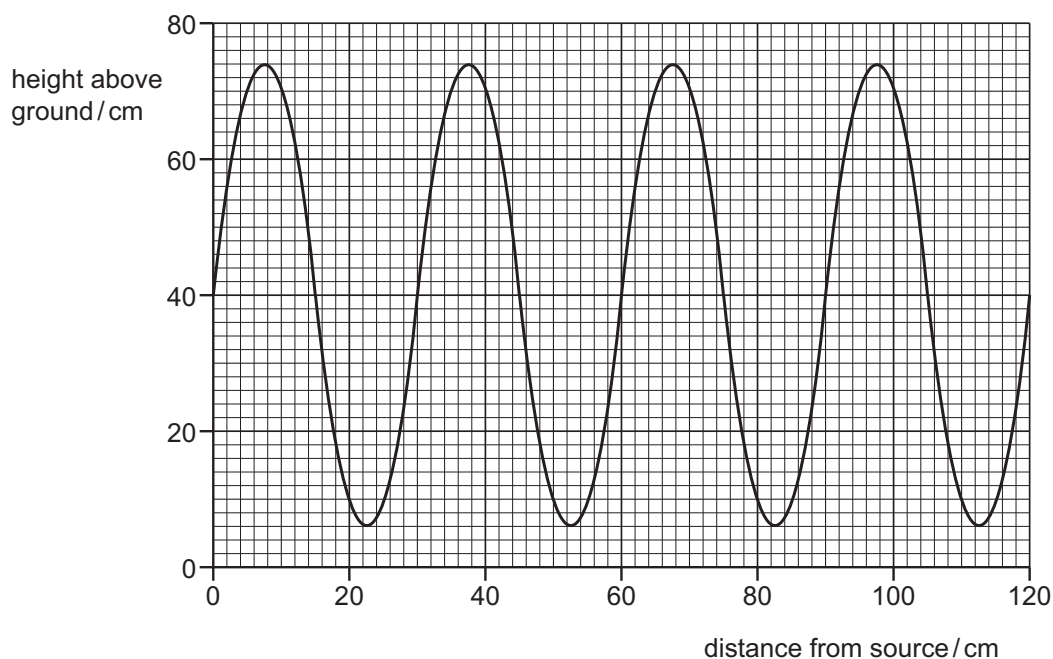
As the wave passes, the boat starts to move up and down and gains kinetic energy from the wave.

Which property of the wave changes as the wave passes the boat?

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

5054/12/M/J/19/Q25

- 24 The diagram shows how the height above the ground of a rope transmitting a wave varies with distance from the source of vibrations at one instant in time.



What is the amplitude of the wave shown?

- A** 30 cm **B** 34 cm **C** 72 cm **D** 74 cm

5054/12/M/J/20/Q29

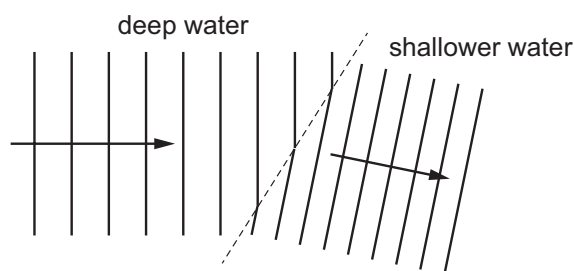
- 25 A vibrator produces 12 wavelengths on the surface of water in 10 s. The spacing between the first crest and the third crest is 60 cm.

What is the speed of the wave?

- A** 24 cm/s **B** 25 cm/s **C** 36 cm/s **D** 72 cm/s

5054/12/M/J/20/Q30

- 26 A water wave in a ripple tank refracts as it moves from deep water into shallower water.



What happens to the speed and to the frequency of the wave as it moves into shallower water?

	speed	frequency
A	decreases	stays constant
B	increases	stays constant
C	stays constant	decreases
D	stays constant	increases

5054/11/M/J/21/Q20

- 27 A wave in the sea collides with a cliff.

A crest of the wave hits the cliff once every 6.0 s.

The horizontal distance between a crest and the adjacent trough of the wave is 4.5 m.

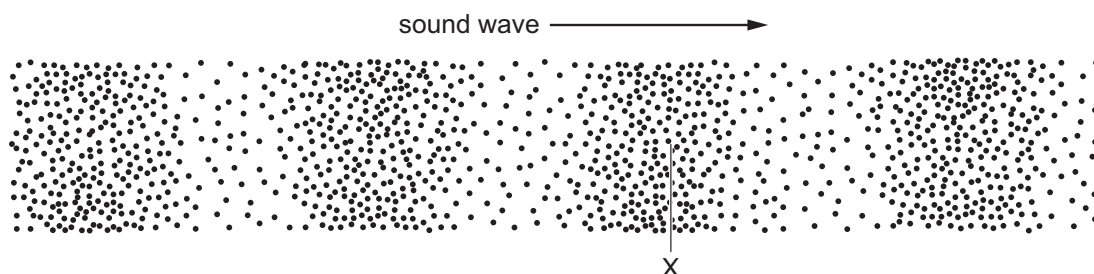
What is the speed of the wave?

- A** 0.67 m/s **B** 0.75 m/s **C** 1.3 m/s **D** 1.5 m/s

5054/11/M/J/22/Q19

- 28 A sound wave passes through a substance.

The diagram shows the position of molecules of the substance at one point in time.

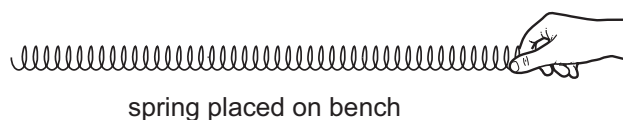


Which type of wave is a sound wave and what is at X?

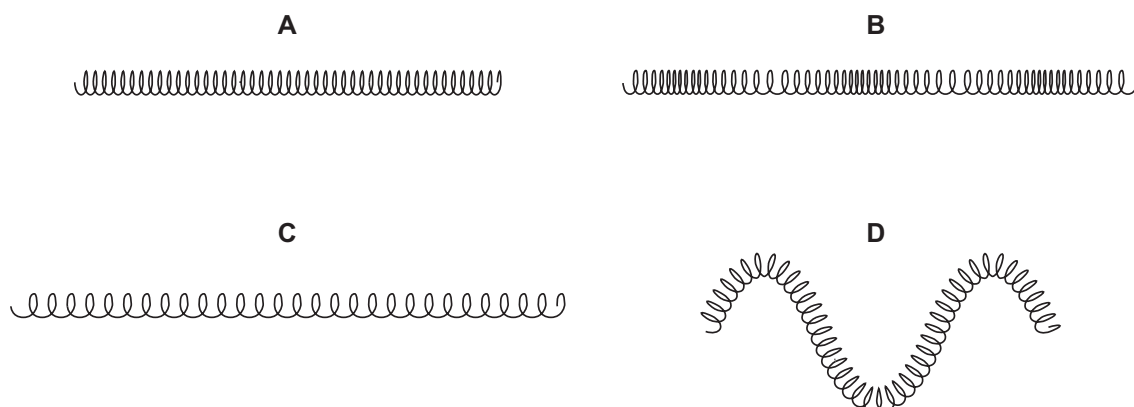
	type of wave	at X
A	longitudinal	compression
B	longitudinal	rarefaction
C	transverse	compression
D	transverse	rarefaction

5054/12/M/J/22/Q27

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

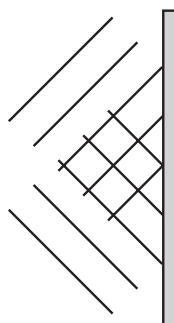


Which diagram demonstrates the type of wave produced by a source of sound?



5054/11/O/N/11/Q23

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

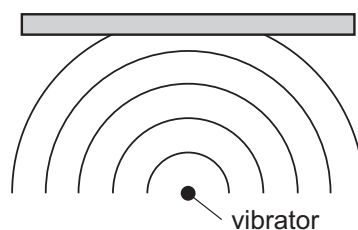


What does the pattern show?

- A waves being reflected
- B waves being refracted
- C waves changing frequency
- D waves changing speed

5054/11/O/N/12/Q21

- 31 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 ●

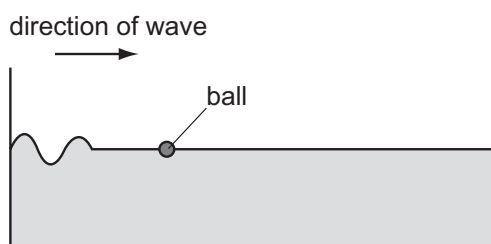
B ●

C ●

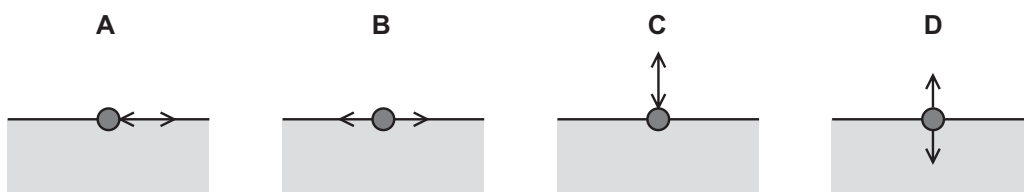
D ● vibrator

5054/12/O/N/12 /Q21

- 32 The diagram shows a ball floating in a tank of water.



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



5054/11/O/N/13/Q19

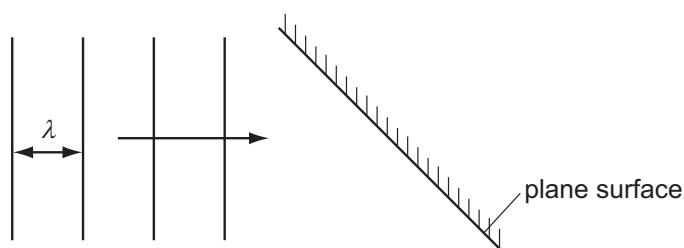
- 33 A wave of frequency 13 000 Hz travels 1300 m in 4.0 s.

What is the wavelength of the wave?

- A 0.025 m B 0.40 m C 2.5 m D 40 m

5054/11/O/N/14/Q19

- 34 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

5054/11/O/N/15 /Q19

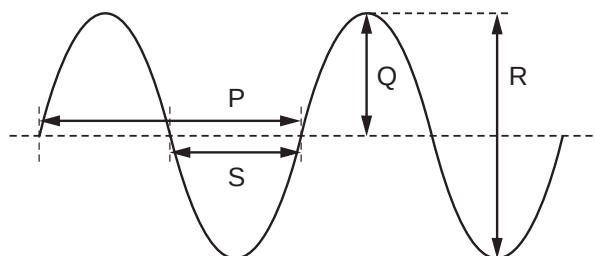
- 35 A phone rings and lights up.

Which types of wave are associated with the phone's operation?

	light	sound
A	longitudinal	longitudinal
B	longitudinal	transverse
C	transverse	longitudinal
D	transverse	transverse

5054/11/O/N/16/Q21

- 36 The diagram shows the surface of water as a wave passes across a ripple tank.



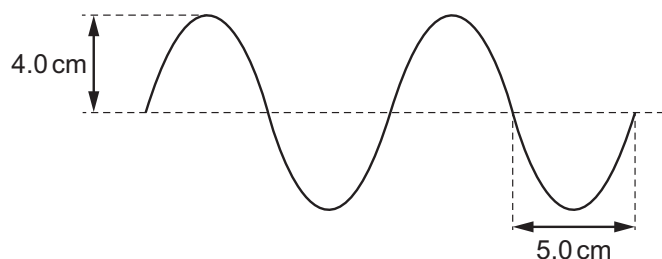
Which lengths represent the amplitude and the wavelength of the wave?

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

5054/11/O/N/16/Q22

- 37 A wave is travelling in water in a glass-sided tank.

The diagram shows a side view of the wave at one instant.



What are the amplitude and the wavelength of the wave?

	amplitude /cm	wavelength /cm
A	4.0	5.0
B	4.0	10
C	8.0	5.0
D	8.0	10

5054/11/O/N/17/Q18

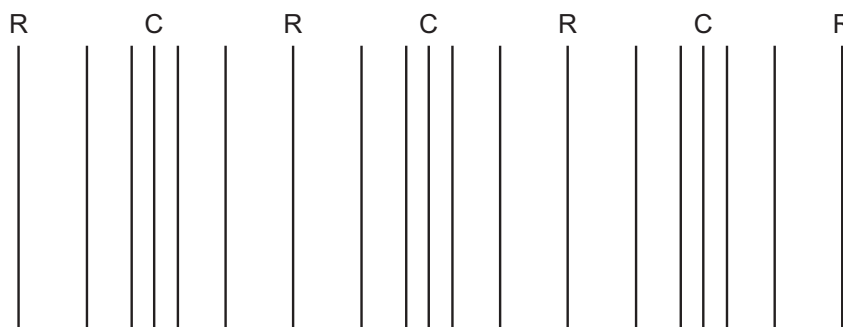
- 38 An earthquake wave travels through the solid surface of the Earth from east to west. The solid surface vibrates in a north-south direction.

How can the earthquake wave be described?

- A** electromagnetic
- B** longitudinal
- C** sound
- D** transverse

5054/11/O/N/17/Q19

- 39 A sound wave in a solid is represented by a series of lines. The diagram shows compressions C and rarefactions R at one instant in time.



Which statement is correct?

- A All particles on one line move in the same direction at the same time.
- B The direction of travel of the sound wave is parallel to the lines.
- C The distance between a compression and its adjacent rarefaction is a wavelength.
- D The pattern of lines represents a transverse wave.

5054/12/O/N/17/Q19

- 40 Which term is the number of crests of a wave passing a point per second?

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

5054/11/O/N/18/Q18

- 41 Which statement about a water wave is correct?

- A The amplitude is the vertical distance between a trough and a peak.
- B The frequency is the number of troughs passing a point in one second added to the number of peaks passing a point in one second.
- C The speed is the horizontal distance travelled per second by a peak.
- D The wavelength is the horizontal distance between a trough and a peak.

5054/12/O/N/18/Q22

42 Which description defines the amplitude of a water wave in a ripple tank?

- A** half of the vertical distance between a trough and a peak
- B** the horizontal distance between adjacent peaks
- C** the horizontal distance between a trough and an adjacent peak
- D** the vertical distance between a trough and a peak

5054/12/O/N/19/Q22

43 Here are four statements about wavefronts.

- 1 Wavefronts from a point source are straight lines.
- 2 Wavefronts from a point source are circular.
- 3 Wavefronts are parallel to the direction of energy movement.
- 4 Wavefronts are perpendicular to the direction of energy movement.

Which two statements are correct?

- A** 1 and 3
- B** 1 and 4
- C** 2 and 3
- D** 2 and 4

5054/12/O/N/19/Q23

44 An electromagnetic wave has a speed of 3.0×10^8 m/s and a wavelength of 10 cm.

What is the frequency of the wave?

- A** 3.3×10^{-10} Hz
- B** 3.3×10^{-8} Hz
- C** 3.0×10^7 Hz
- D** 3.0×10^9 Hz

5054/11/O/N/20/Q26

45 Which description of a sound wave is correct?

- A** a longitudinal electromagnetic wave
- B** a transverse electromagnetic wave
- C** an oscillation of particles parallel to the direction of travel of the wave energy
- D** an oscillation of particles perpendicular to the direction of travel of the wave energy

5054/11/O/N/20/Q30

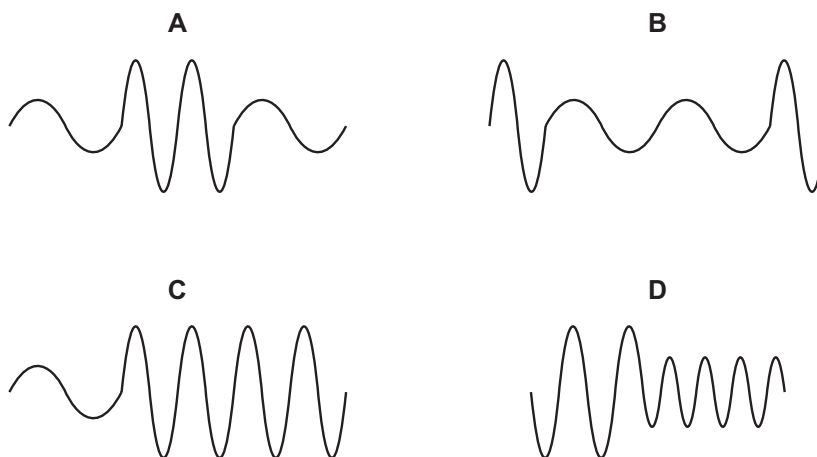
46 Which statement about light passing from air to glass is correct?

- A The frequency of the light waves decreases.
- B The speed of the light waves decreases.
- C The wavelength of the light waves increases.
- D The wavelength of the light waves remains unchanged.

5054/12/O/N/20/Q24

47 A water wave on a pond passes into a region where the wave travels more slowly. It then returns to a region where it travels at the original speed. Assume that the frequency of the wave stays constant.

Which side-view of the wave is correct?



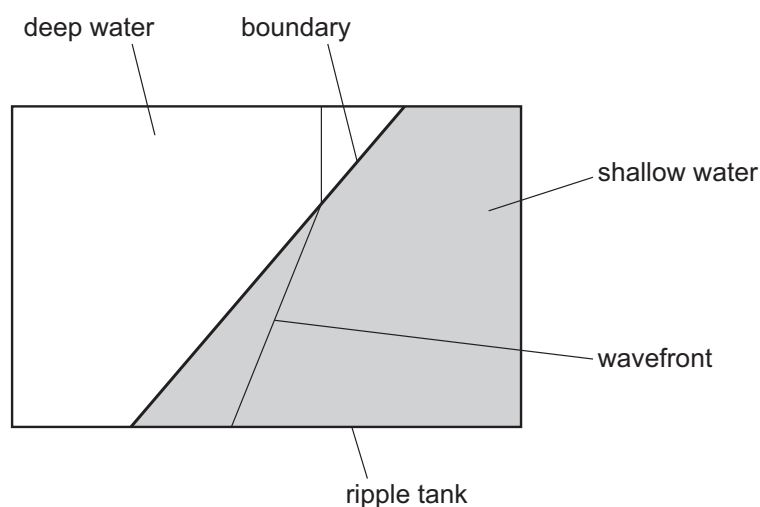
5054/11/O/N/21/Q17

48 What is meant by the *amplitude* of a wave?

- A the distance between the extreme points of a particle's motion
- B the maximum distance a particle moves from its equilibrium position
- C the maximum energy carried by the wave
- D the maximum power of the vibrations carrying the wave

5054/11/O/N/21/Q18

- 49 The diagram shows one wavefront of a wave as it travels from deep water to shallow water in a ripple tank.



What happens as the wavefront moves into the shallow water?

- A The speed of the wavefront increases.
 - B The speed of the wavefront decreases.
 - C The wavelength of the wave remains constant.
 - D The wavelength of the wave increases.
- 50 Which example describes a transverse wave being refracted?
- A infrared waves travelling in an optical fibre
 - B light waves from an object entering a magnifying glass
 - C ultrasound waves being used to clean jewellery
 - D water waves hitting a barrier

5054/11/O/N/21/Q19

5054/12/O/N/21/Q22