7. Waves

7.2 Transverse and longitudinal waves

Paper 1

Question Paper

1 The diagram shows the shape at one instant in time of part of a stretched string as a wave travels along it from left to right.



What are the directions of the velocities of the points 1, 2 and 3 on the string at this instant in time?

	point 1	point 2	point 3
A	→	→	→
B	→	←	→
C	↑	↓	↑
D	↓	↑	↓

2 A guitar string is plucked.

Which statement describes the resulting waves?

A Longitudinal waves on the string cause longitudinal waves in the air.

B Longitudinal waves on the string cause transverse waves in the air.

C Transverse waves on the string cause longitudinal waves in the air.

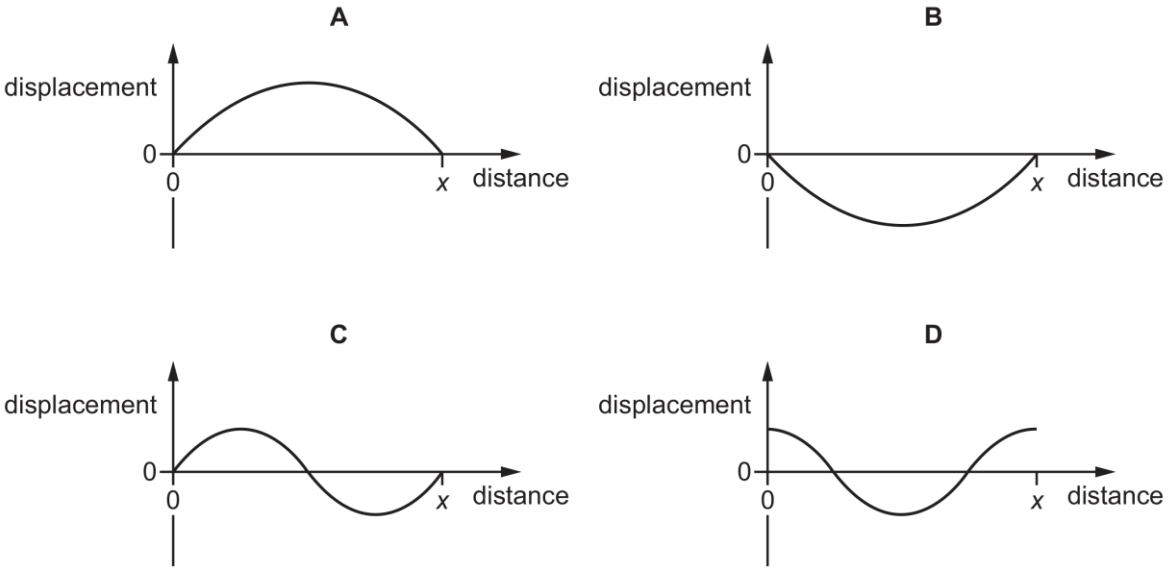
D Transverse waves on the string cause transverse waves in the air.

3 A progressive longitudinal sound wave moves through air. The diagram shows the positions of the air particles along part of the wave at one instant.



Point Q is a distance *x* from point P.

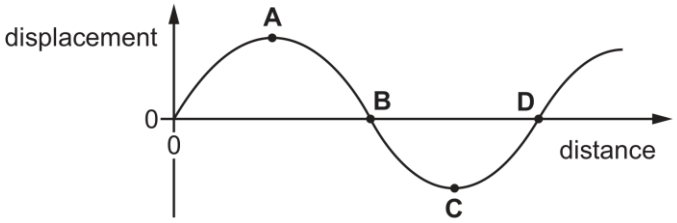
Which graph shows the variation of the displacement of the air particles with distance from P along the wave?



4 A longitudinal wave is travelling from left to right. The graph shows the variation of the displacement of the particles with distance along the wave at one instant in time.

Displacements to the right are positive; displacements to the left are negative.

Which labelled point represents a compression?

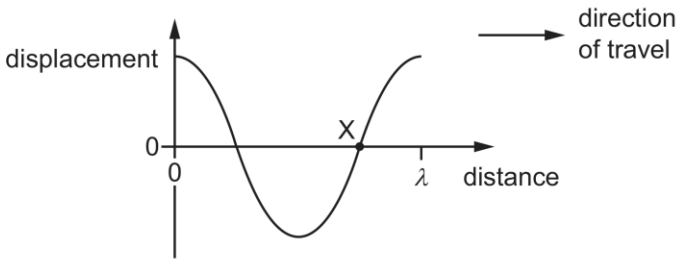


5 Which row is correct for both progressive transverse waves and progressive longitudinal waves?

	transverse waves	longitudinal waves
A	contain compressions and rarefactions	some can travel in a vacuum
B	can be polarised	contain compressions and rarefactions
C	vibrations are perpendicular to the direction of travel of the wave energy	can be polarised
D	some can travel in a vacuum	vibrations are perpendicular to the direction of travel of the wave energy

6 A transverse wave on a rope has wavelength λ and period T.

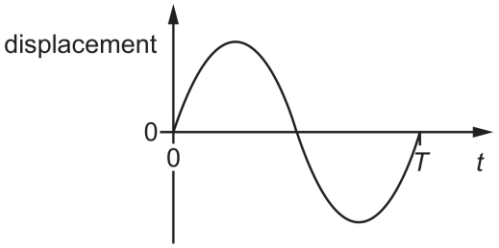
The graph shows the variation of the displacement of the particles of the rope with distance in the direction of travel of the wave at time $t = 0$.



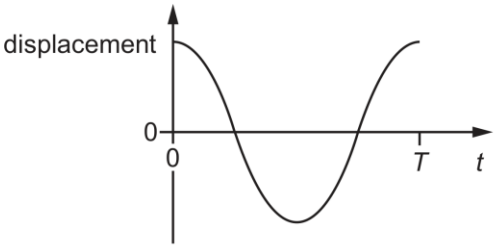
A particle X is labelled.

Which graph shows the variation of the displacement of particle X with time t?

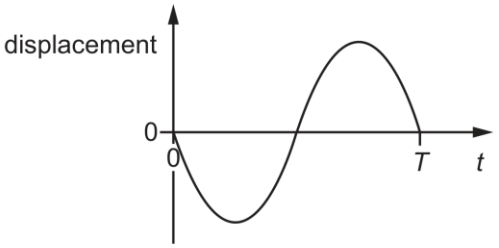
A



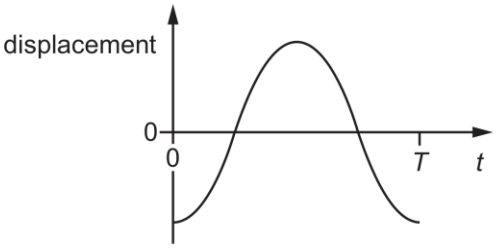
B



C



D



7 Which statement is correct?

A Gases cannot transmit longitudinal waves.

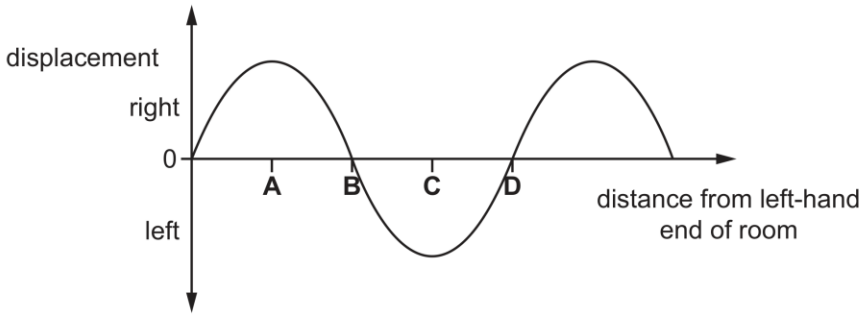
B Longitudinal sound waves cannot form stationary waves.

C Solids can transmit both transverse and longitudinal waves.

D Transverse waves cannot pass through a vacuum.

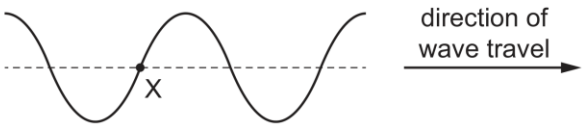
8 A sound wave travels from left to right across a room. The variation with distance across the room of the displacement of the air molecules at one instant is shown.

At which distance will the air pressure be lowest?



9 A transverse wave travels along a rope. The diagram shows the rope at time $t = 0$.

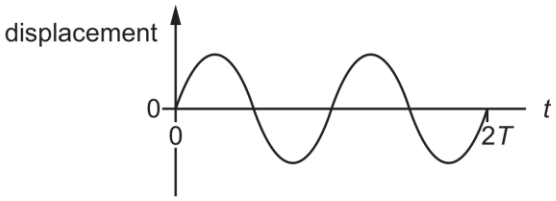
The wave is travelling from left to right. The period of the wave is T.



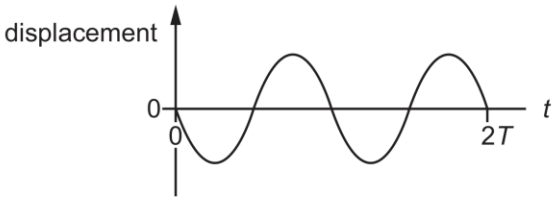
One particle of the rope is labelled X.

Which graph shows the variation with time of the displacement of particle X between $t = 0$ and $t = 2T$?

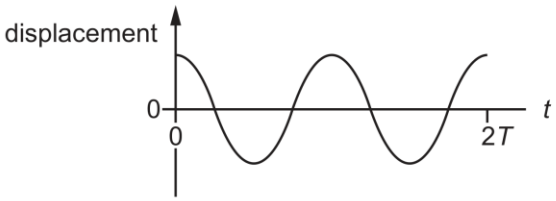
A



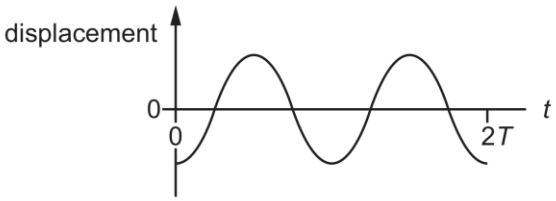
B



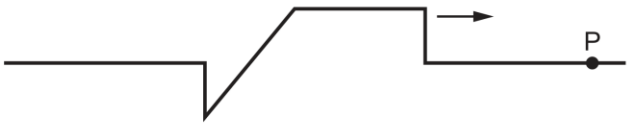
C



D

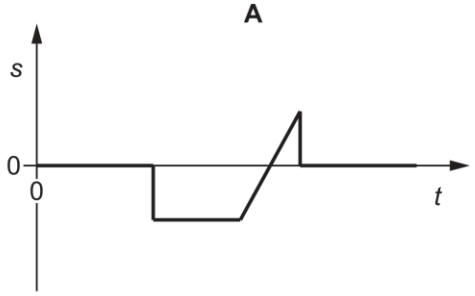


10 A wave pulse moves along a stretched rope in the direction shown.

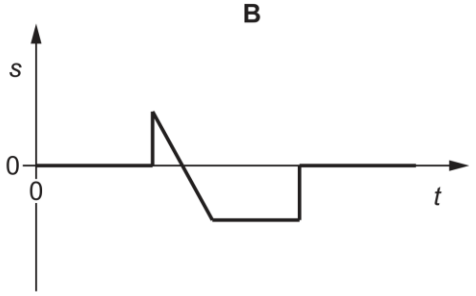


Which diagram shows the variation with time *t* of the displacement *s* of the particle P in the rope?

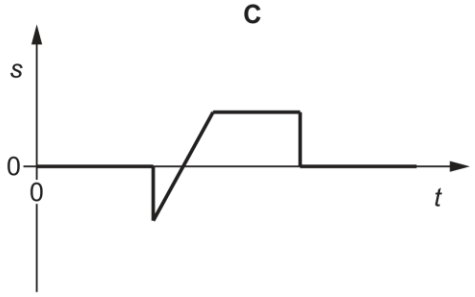
A



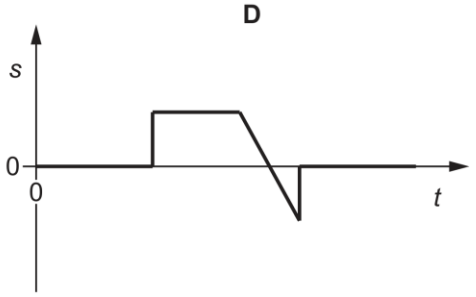
B



C



D



11 Which statement about progressive transverse and longitudinal waves is correct?

A Particles in a transverse wave have fixed equilibrium positions but those in longitudinal waves do not.

B Transverse waves can be polarised but longitudinal waves cannot.

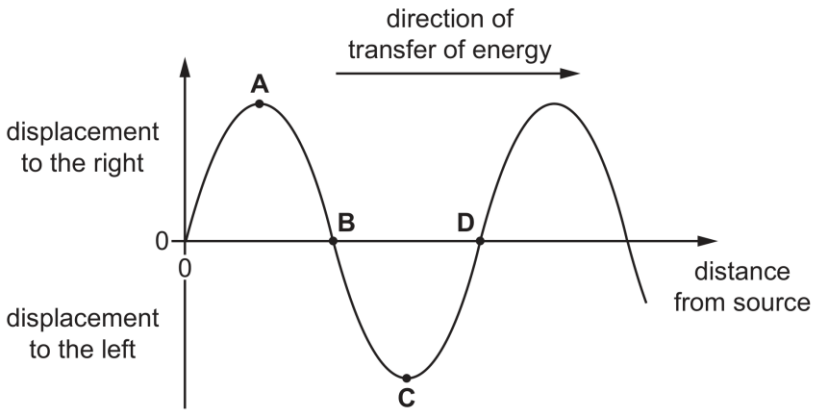
C Transverse waves transfer energy but longitudinal waves do not.

D Two-source interference can be demonstrated with transverse waves but not with longitudinal waves.

12 A longitudinal wave travelling from left to right has vibrations parallel to the direction of transfer of energy by the wave.

The wave can be represented on a graph showing the variation with distance of the displacement of the particles from their equilibrium positions at one instant.

Which point on the graph is the centre of a compression?



13 Which statement about transverse or longitudinal waves is **not** correct?

A Longitudinal waves can be used to demonstrate diffraction.

B Longitudinal waves can travel in a vacuum.

C Transverse waves can form stationary waves.

D Transverse waves can transfer energy.

14 The table contains descriptions and examples of waves.

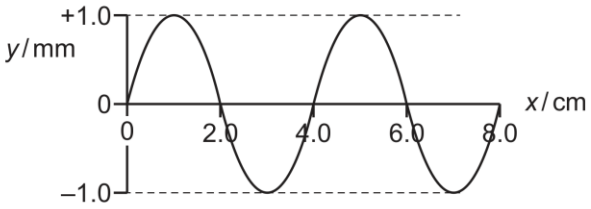
Which row is correct?

	description of wave	example
A	oscillations are parallel to the direction of energy transfer	gamma-rays
B	oscillations are parallel to the direction of energy transfer	ultraviolet waves
C	oscillations are perpendicular to the direction of energy transfer	sound waves
D	oscillations are perpendicular to the direction of energy transfer	X-rays

15 A transverse wave in a medium has the waveform shown, where

y = vertical displacement and x = horizontal distance.

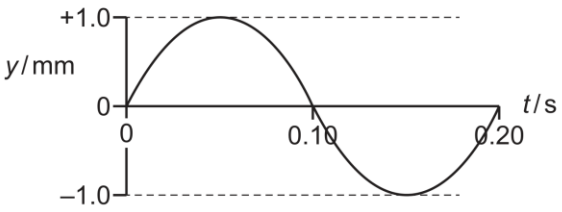
The speed of the wave is $20.0\,\text{cm}\,\text{s}^{-1}$.



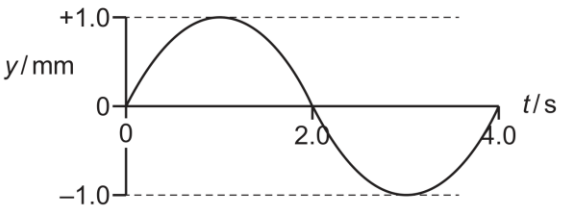
A particle of the medium oscillates vertically.

Which graph of vertical displacement y against time t best represents the motion of this particle?

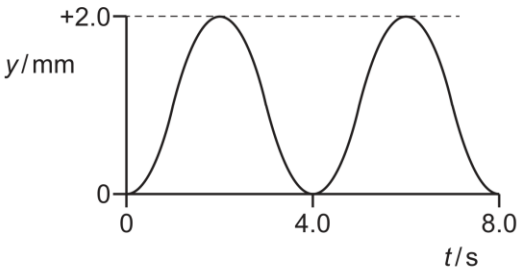
A



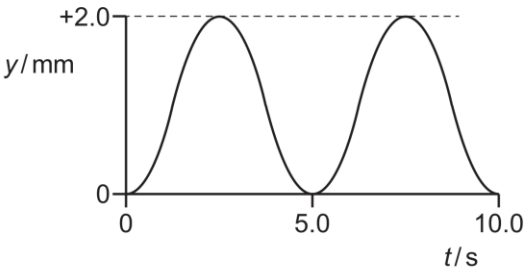
B



C

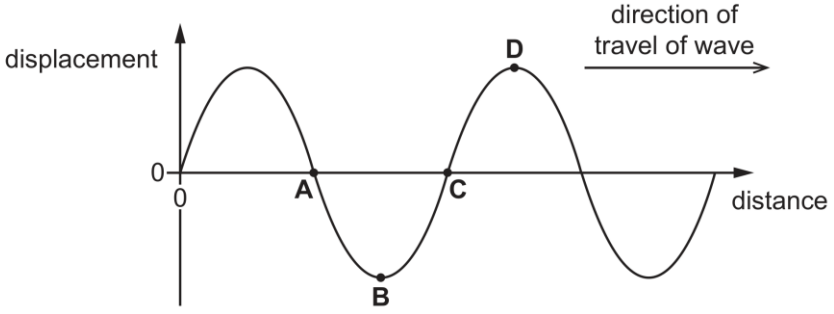


D



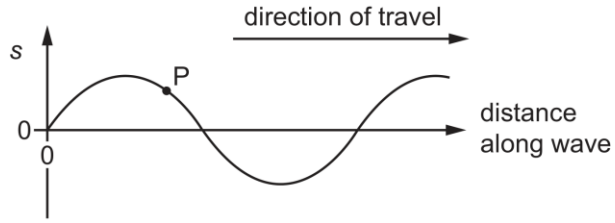
16 The graph shows the variation of the displacement of particles with distance along a transverse wave at an instant in time. The wave is moving to the right.

Which position along the wave corresponds to a point where particles in the wave are travelling the fastest upwards?



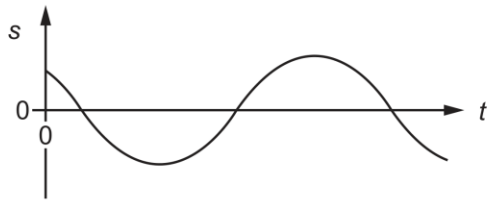
17 A wave moves along the surface of water.

The diagram shows the variation of displacement *s* with distance along the wave at time *t* = 0.

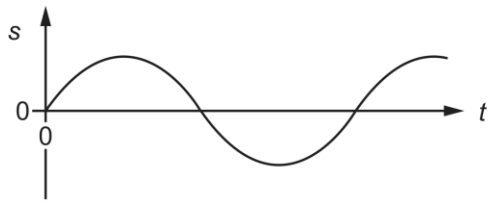


Which graph best shows the variation with time *t* of the displacement *s* of the point P on the wave?

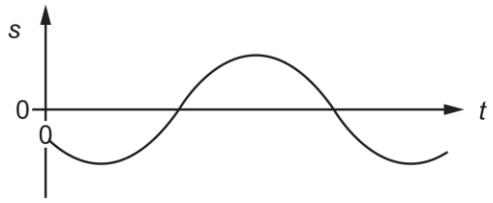
A



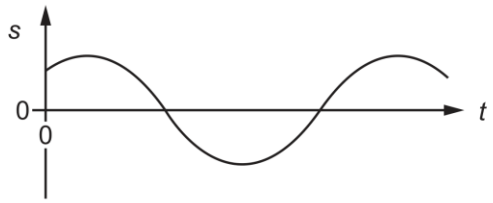
B



C



D



18 Which statement about all types of transverse waves is correct?

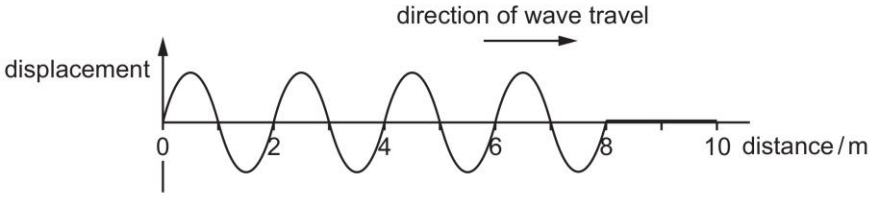
A They all have the same speed.

B They all have vibrations that are parallel to the direction of propagation of energy.

C They can all form stationary waves.

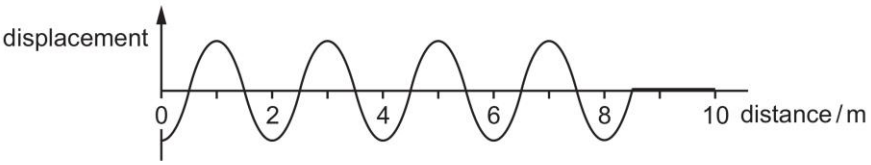
D They can all travel through a vacuum.

19 A transverse wave is travelling along a rope. The frequency of the wave is 2.0 Hz. The graph shows the variation with distance of the displacement of the wave at time $t = 0$.

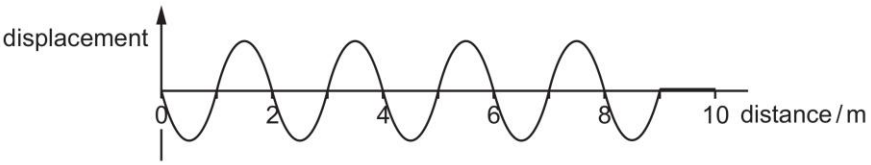


Which diagram shows the position of the wave at time $t = 0.5$ s?

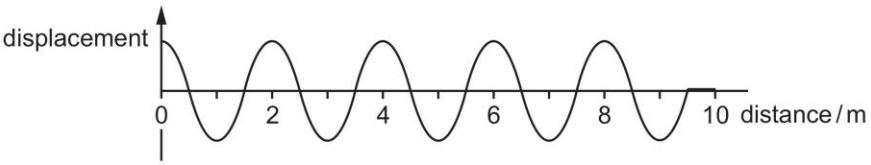
A



B



C



D

