Q1.

A stationary wave is formed due to superposition between a progressive wave and its reflection.
Both the progressive wave and its reflection are polarised.

Which statement about the progressive wave and its reflection is true at an antinode?

A They must be longitudinal waves. ⬭

B They must be coherent. ⬭

C They must have different frequencies. ⬭

D They must be polarised in the same plane. ⬭

(Total 1 mark)

Q2.

Which row is correct for both a progressive wave and a stationary wave?

	Progressive wave	Stationary wave	
A	Some of the particles do not vibrate.	All the particles vibrate in phase with each other.	⬭
B	None of the particles vibrate with the same amplitude.	All the particles vibrate with the same amplitude.	⬭
C	All the particles vibrate.	Some of the particles do not vibrate.	⬭
D	All the particles vibrate in phase with each other.	None of the particles vibrate in phase with each other.	⬭

(Total 1 mark)

Q3.

A laser emits light of wavelength 600 nm for 10 ns.

What is the number of complete waves emitted by the laser?

A 5×10^{17} ⬭

B 5×10^{12} ⬭

C 5×10^{8} ⬭

D 5×10^{6} ⬭

(Total 1 mark)

Q4.

A detector measures the intensity of light from a source S_1.
Polaroid material is placed between source S_1 and the detector. When the material is rotated through a small angle, the detected intensity does not change.
When this procedure is repeated for a source S_2, the detected intensity decreases.

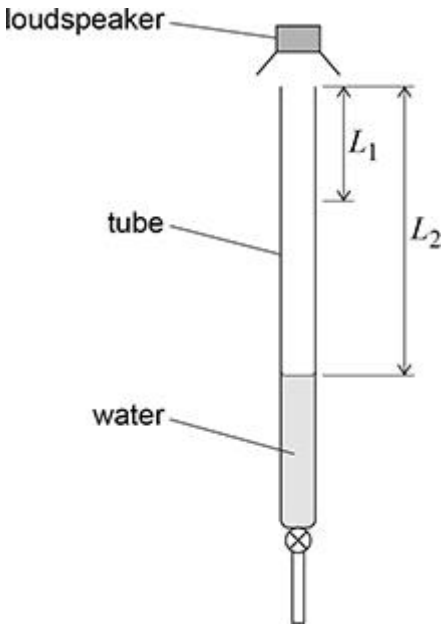
Which is correct?

	Light waves from S_1	Light waves from S_2	
A	unpolarised	polarised	⬭
B	unpolarised	unpolarised	⬭
C	polarised	polarised	⬭
D	polarised	unpolarised	⬭

(Total 1 mark)

Q5.

A loudspeaker producing a single-frequency sound is mounted above a tube filled with water. A tap at the bottom of the tube is opened to allow the water to run out.



A student observes the change in loudness of the sound emitted by the tube as the water runs out.
When the length of the column of air in the tube reaches L_1, the loudness is at its first maximum.
The next maximum is reached when the length of the column of air is L_2.

What is the wavelength of the sound emitted by the loudspeaker?

A L_2 ⬭

B $2L_1$ ⬭

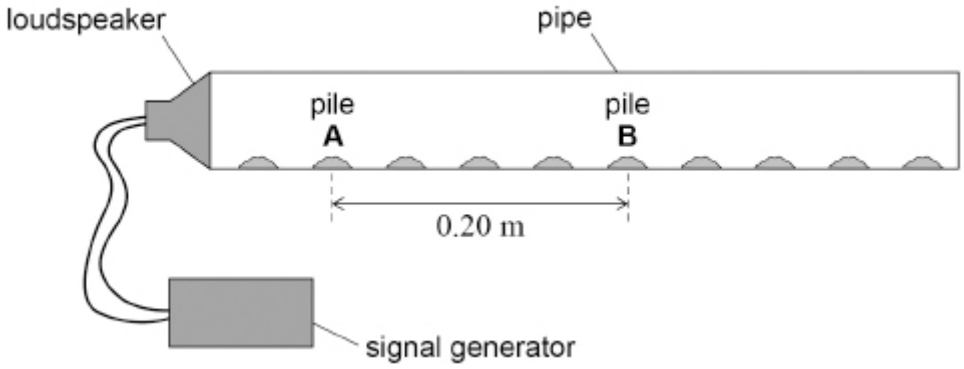
C $L_2 - L_1$ ⬭

D $2(L_2 - L_1)$ ⬭

(Total 1 mark)

Q6.

Powder is spread along the inside of an air-filled pipe that is closed at one end.
A loudspeaker is placed at the other end.
At certain sound frequencies a stationary wave is produced so that powder collects in evenly spaced piles. These piles correspond to positions of minimum amplitude.



The distance between pile **A** and pile **B** is 0.20 m.

What is the wavelength of the stationary sound wave?

A 0.04 m ○

B 0.05 m ○

C 0.10 m ○

D 0.20 m ○

(Total 1 mark)

Q7.

Two aerials $\mathbf{A_1}$ and $\mathbf{A_2}$ receive radio waves from the same distant transmitter **T**.

The waves have a frequency of 88 MHz.
The phase difference between the waves received by $\mathbf{A_1}$ and $\mathbf{A_2}$ is 6.6 rad.

What is the distance $\mathbf{A_1T} - \mathbf{A_2T}$?

A 1.6 m ○

B 3.2 m ○

C 3.6 m ○

D 7.2 m ○

(Total 1 mark)

Q8.

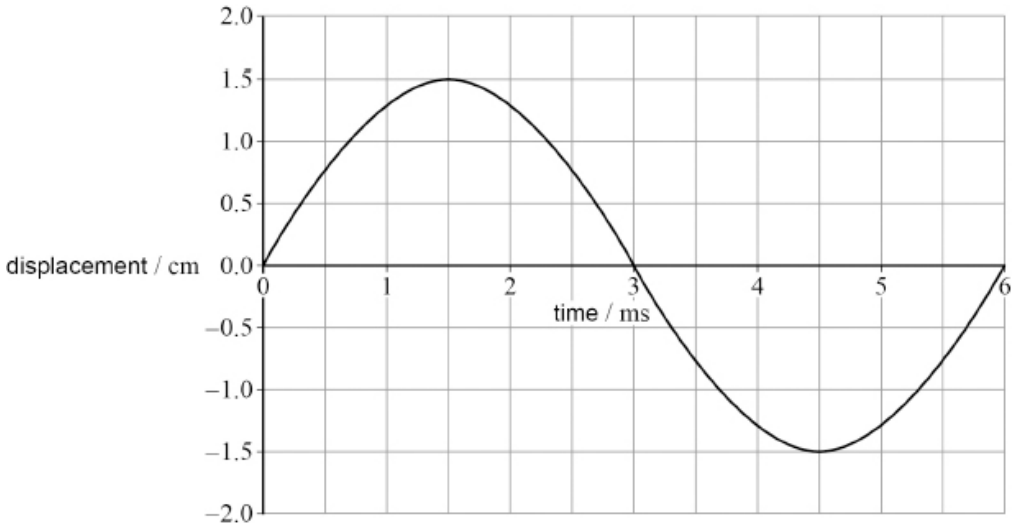
A stationary wave of wavelength λ is produced on a string.
What are the phase difference and the distance between adjacent antinodes?

	Phase difference	Distance	
A	$\frac{\pi}{2}$	$\frac{\lambda}{4}$	⬭
B	$\frac{\pi}{2}$	$\frac{\lambda}{2}$	⬭
C	π	$\frac{\lambda}{4}$	⬭
D	π	$\frac{\lambda}{2}$	⬭

(Total 1 mark)

Q9.

A string with a length of 1.2 m vibrates at its second harmonic.
The diagram shows the displacement–time graph for a point on the string.



What are the wavelength and frequency of the wave on the string?

	Wavelength / m	Frequency / kHz	
A	0.6	0.17	⬭
B	0.6	0.34	⬭
C	1.2	0.17	⬭
D	1.2	0.34	⬭

(Total 1 mark)

Q10.

A standing wave is created on a string.

Which statement about the two waves that create the standing wave is **not** correct?

A They have the same frequency. ⬭

B They have a constant phase relationship. ⬭

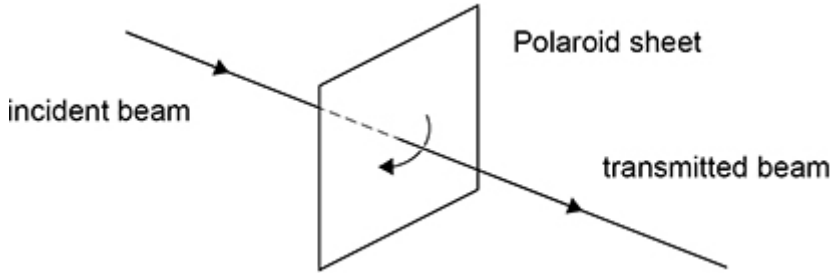
C They travel in opposite directions. ⬭

D They have the same speed. ⬭

(Total 1 mark)

Q11.

A narrow beam of light is incident on a sheet of Polaroid material. The intensity of the transmitted beam is a maximum.



The Polaroid sheet is rotated about the beam by 90° and the intensity of the transmitted beam decreases to zero.

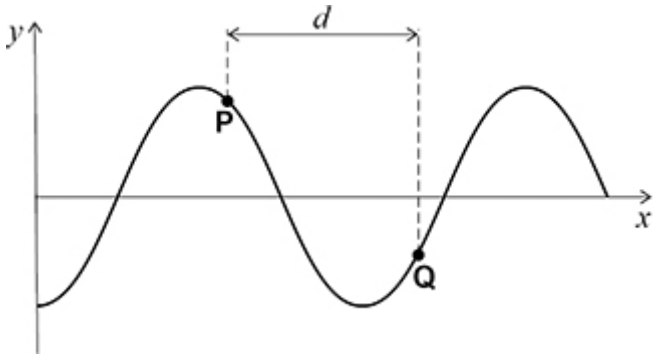
Which row explains this observation?

	Nature of incident beam	Action of Polaroid material as it is rotated	
A	unpolarised	polarises the incident beam	⬭
B	unpolarised	absorbs the incident beam	⬭
C	polarised	absorbs the incident beam	⬭
D	polarised	changes the plane of polarisation of the incident beam	⬭

(Total 1 mark)

Q12.

Two points **P** and **Q** on a progressive wave are separated by distance d.



The phase difference between **P** and **Q** is θ rad.

What is the wavelength?

A $\frac{\theta d}{2\pi}$ ⬭

B θd ⬭

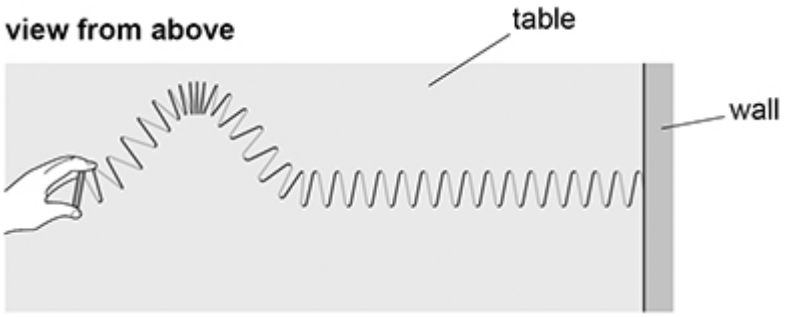
C $\frac{2\pi d}{\theta}$ ⬭

D $\frac{d}{\theta}$ ⬭

(Total 1 mark)

Q13.

A long spring is used to demonstrate wave motion. The spring lies horizontally on a table. One end of the spring is attached to a wall.



The free end of the spring is quickly moved to one side and then back to the centre, creating a pulse.
This movement takes 0.40 s.
The pulse travels 4.0 m along the spring in a time of 2.0 s.

What is the length of the pulse?

A 0.8 m ○

B 1.6 m ○

C 2.0 m ○

D 10.0 m ○

(Total 1 mark)

Q14.

A stretched wire vibrates between two fixed points.
The frequency of the first harmonic of the vibrating wire is 300 Hz.
Without making any other change, the tension in the wire is doubled.

What is the frequency of the new first harmonic of the wire?

A 150 Hz ○

B 420 Hz ○

C 600 Hz ○

D 1200 Hz ○

(Total 1 mark)

Q15.

A stationary wave forms on a uniform string.
Which statement is correct?

A The amplitude of oscillations is a maximum at the nodes. ⬭

B The distance between two adjacent nodes equals one wavelength. ⬭

C The oscillations at two adjacent antinodes are in antiphase. ⬭

D The time period of oscillating sections varies along the string. ⬭

(Total 1 mark)

Q16.

A longitudinal wave of frequency $660\ \text{Hz}$ travels through a medium.
The wave speed is $330\ \text{m s}^{-1}$.
Which statement describes the motion of a particle in the wave?

A It is travelling at a speed of $330\ \text{m s}^{-1}$. ⬭

B It moves in phase with a particle in the wave $25\ \text{cm}$ away. ⬭

C It oscillates with a time period of $1.5\ \text{ms}$. ⬭

D It changes direction 660 times every second. ⬭

(Total 1 mark)

Q17.

The frequency of the first harmonic of a standing wave on a string is f.
The tension in the string is T.
The tension is increased to $4T$ without changing the length or mass of the string.

Which harmonic has a frequency $2f$ after this change?

A first ⬭

B second ⬭

C third ⬭

D fourth ⬭

(Total 1 mark)