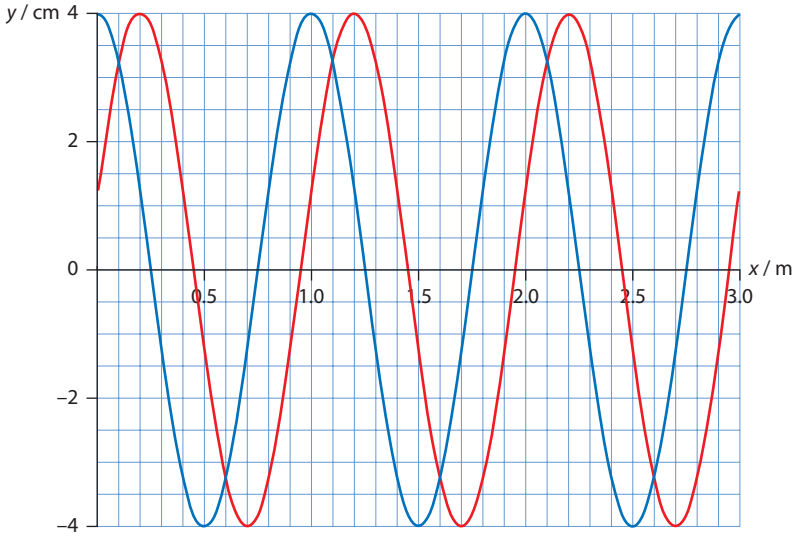
Self-test questions

Topic 4

1 A body of mass m is suspended at the end of a vertical spring. When the body is displaced from equilibrium by an amount A and then released, the body executes simple harmonic oscillations with period T. A second body of mass 4 m is suspended form an identical spring. What will be the period of oscillations of this body when it is displaced by an amount $2A$?

A T
B $2T$
C $4T$
D $8T$

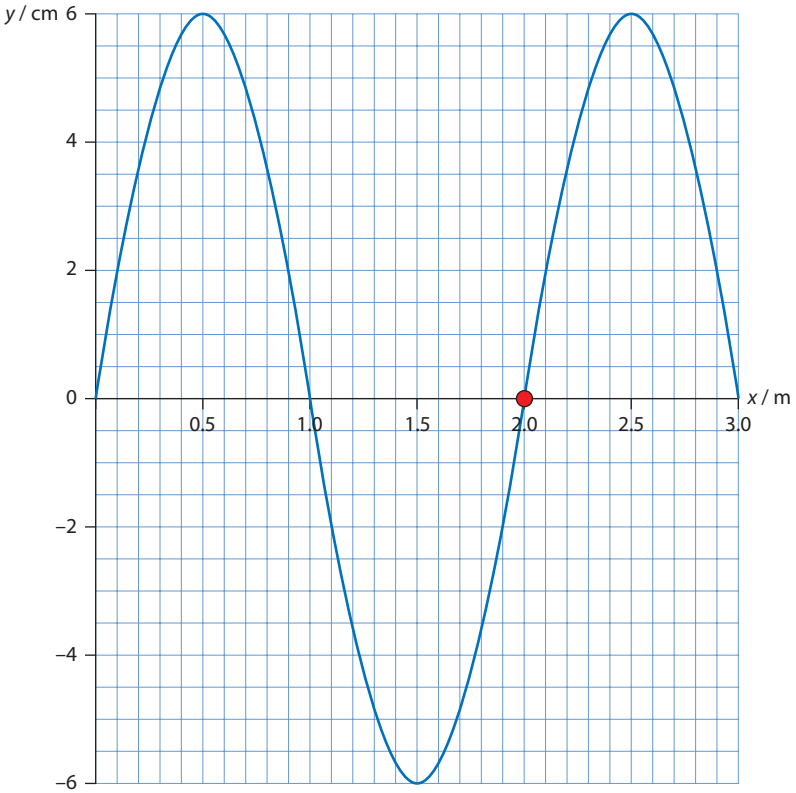
2 The diagram shows the displacement of a wave at time zero (in blue) and at time 0.5 s (in red).



What is the speed of the wave?

A $0.08\ \text{cm s}^{-1}$
B $5.0\ \text{m s}^{-1}$
C $0.40\ \text{m s}^{-1}$
D $0.04\ \text{cm s}^{-1}$

3 The diagram shows the variation with distance of the displacement of a longitudinal wave travelling from right to left. Positive displacements indicate motion to the right.



A point in the medium has been marked. What is the direction of velocity of the marked point?

A Up
B Down
C Right
D Left

4 Which of the following wave phenomena cannot be observed for sound waves?

A diffraction
B refraction
C interference
D polarisation

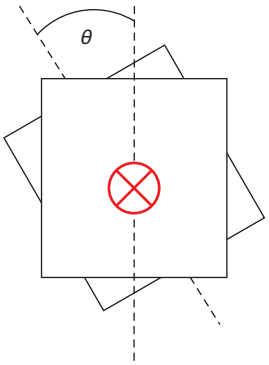
5 A ray of light has wavelength in air. The ray passes into a medium of refractive index $\frac{4}{3}$. What is the wavelength of light in the new medium?

A λ
B 4λ
C $\frac{3\lambda}{4}$
D $\frac{4\lambda}{3}$

6 A ray of light passes though the eye of a needle. Which phenomenon is the transmitted light most likely to show?

A diffraction
B polarisation
C refraction
D absorption

7 Vertically polarised light of intensity I_0 is incident on an arrangement of two parallel polarisers. The first polariser has its transmission axis vertical.



The angle between the transmission axes of the polariser is ϑ.

What is the intensity of the light transmitted through the second polariser?

A 0

B $\frac{I_0}{2}$

C $\frac{I_0}{2}\cos^2\vartheta$

D $I_0\cos^2\vartheta$

8 A tube X of length L_X has both ends open. A tube Y of length L_Y has one end closed and the other open. The frequency of the first harmonic in X is the same as the frequency of the first harmonic in Y. What is the ratio $\frac{L_X}{L_Y}$?

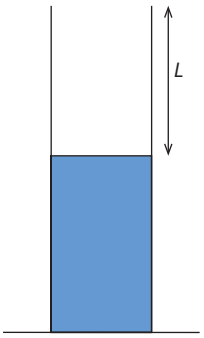
A $\frac{2}{3}$

B $\frac{3}{2}$

C 2

D $\frac{1}{2}$

9 A tuning fork is placed above a tube that is partially filled with water. The level of the water is slowly rising. A loud sound is heard from the tube when $L = 49$ cm and again when $L = 35$ cm.



At which value of L will a loud sound be heard again?

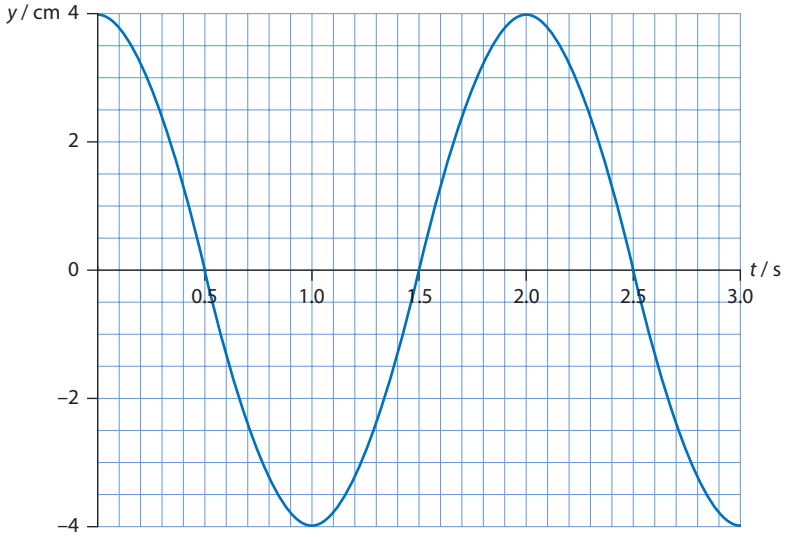
A 42 cm

B 28 cm

C 14 cm

D 7.0 cm

10 The diagram shows the displacement of a medium as a transverse wave of wavelength 5.0 m travels from left to right. What is the average speed of a point in the medium during one period of the wave and what is the speed of the wave?



	Average speed of point in medium	Wave speed
A	4.0 cm s^{-1}	2.5 m s^{-1}
B	2.5 m s^{-1}	8.0 cm s^{-1}
C	2.5 m s^{-1}	8.0 cm s^{-1}
D	8.0 cm s^{-1}	2.5 m s^{-1}