Waves-practice-2-MC *[38 marks]*

1. A high solid wall separates two gardens X and Y. Music from a loudspeaker in X can be heard in Y even though X cannot be seen from Y. The music can be heard in Y due to *[1 mark]*

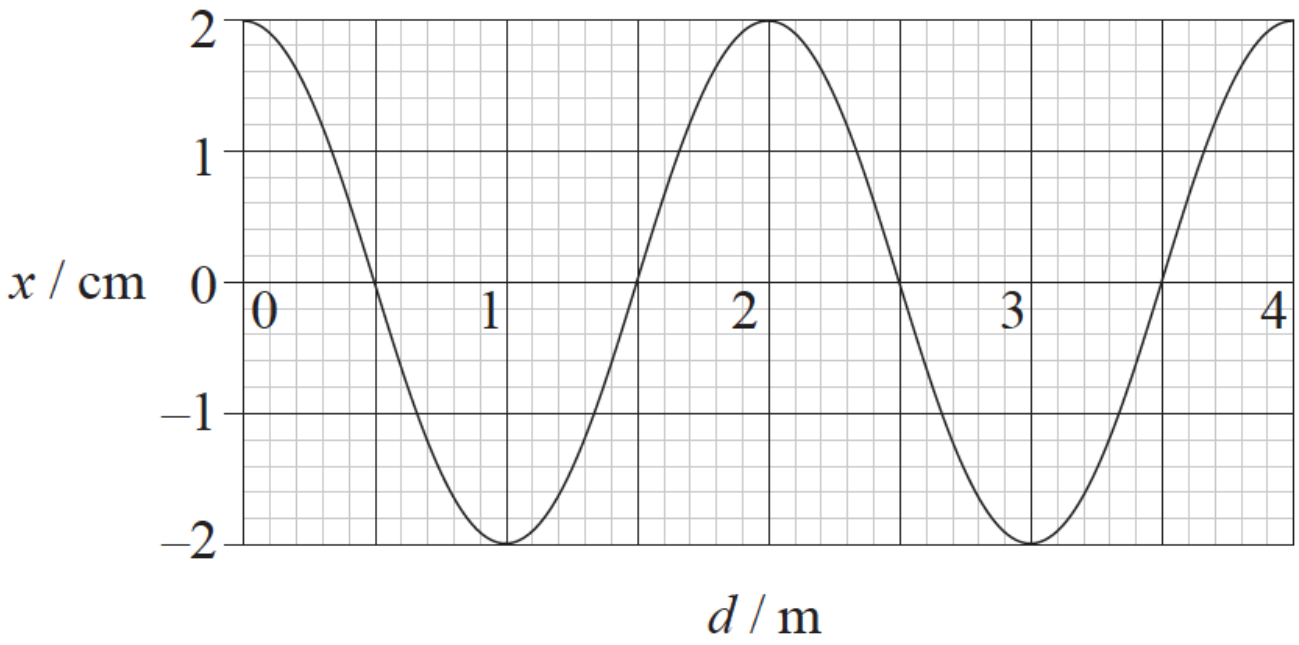
   A. absorption.

   B. diffraction.

   C. reflection.

   D. refraction.

2. A wave of period 5.0m s travels through a medium. The graph shows the variation with distance *d* of the displacement *x* of points in the medium. *[1 mark]*

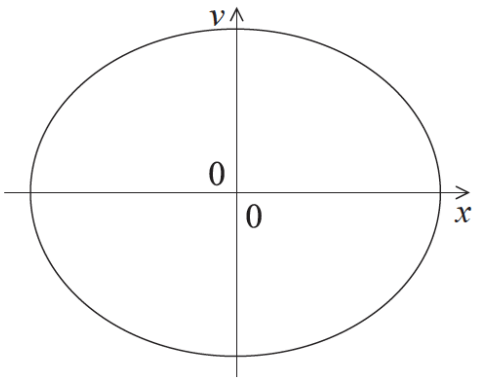


   What is the average speed of a point in the medium during one full oscillation?

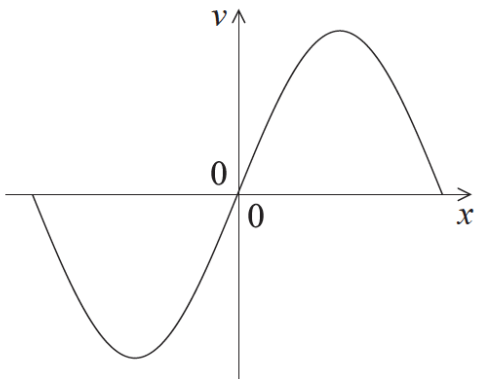
   A. 0m s^{-1}
   B. 4.0m s^{-1}
   C. 16m s^{-1}
   D. 400m s^{-1}

3. A body undergoes simple harmonic motion. Which graph correctly shows the variation with displacement x of the velocity v of the body? *[1 mark]*

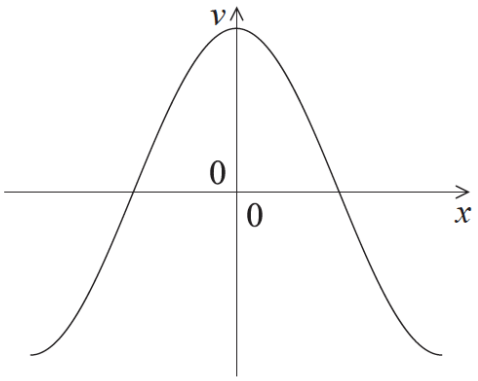
A.



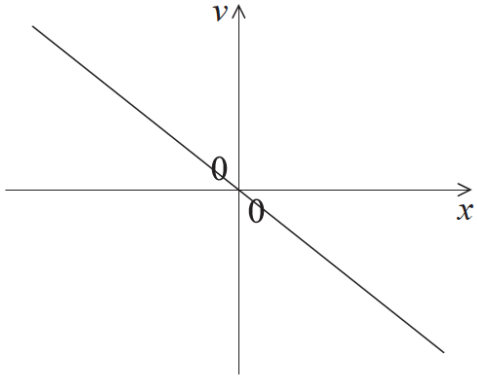
B.



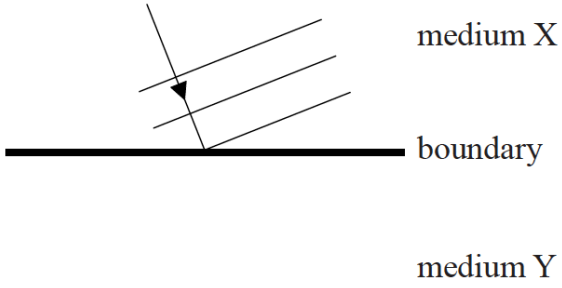
C.



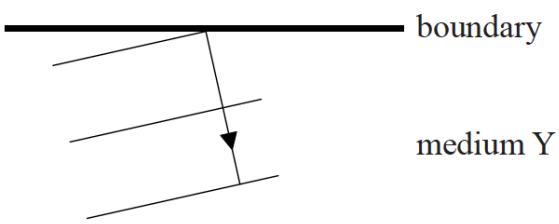
D.



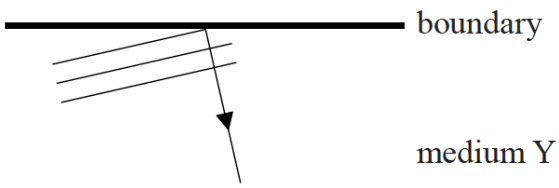
4. The speed of a wave in medium X is greater than the speed of the wave in medium Y. Which diagram shows the correct refraction of the wavefronts at the boundary between X and Y? *[1 mark]*



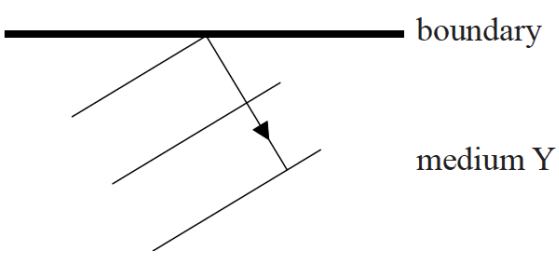
A.



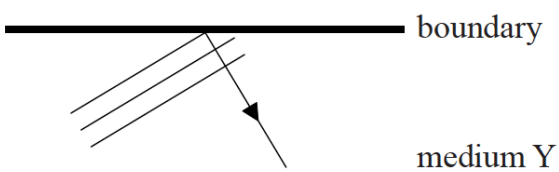
B.



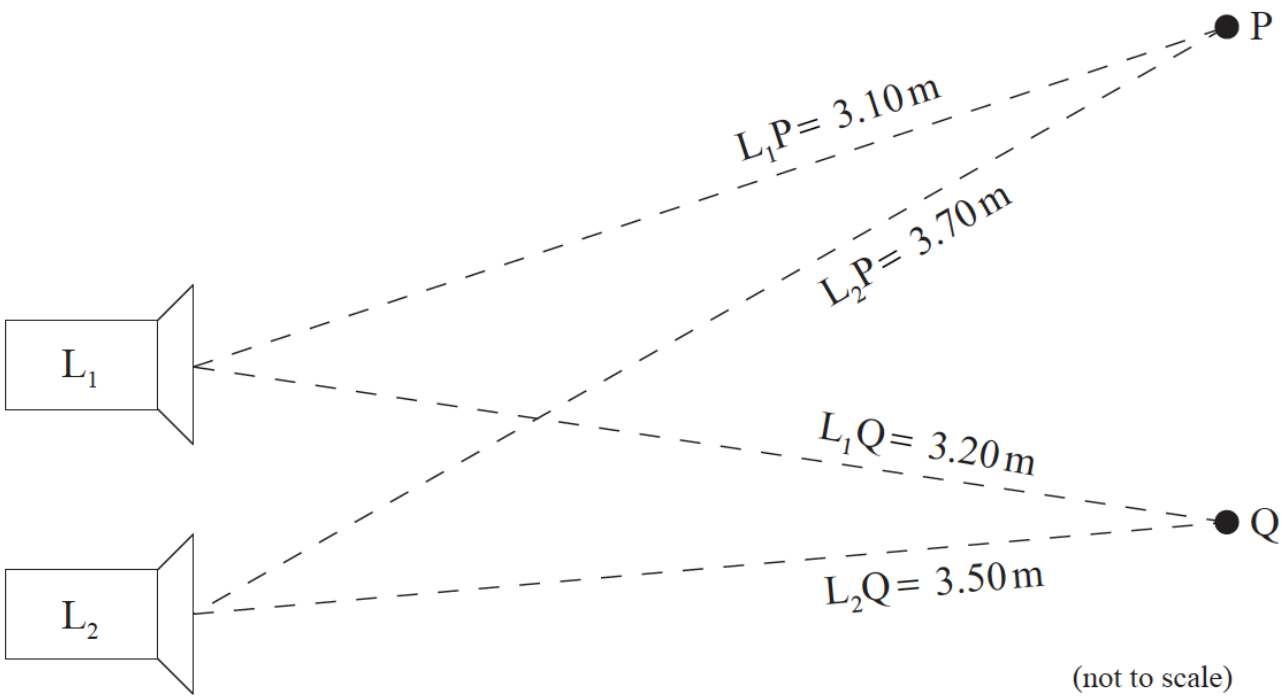
C.



D.



5. Two loudspeakers, L_1 and L_2, emit identical sound waves. *[1 mark]*



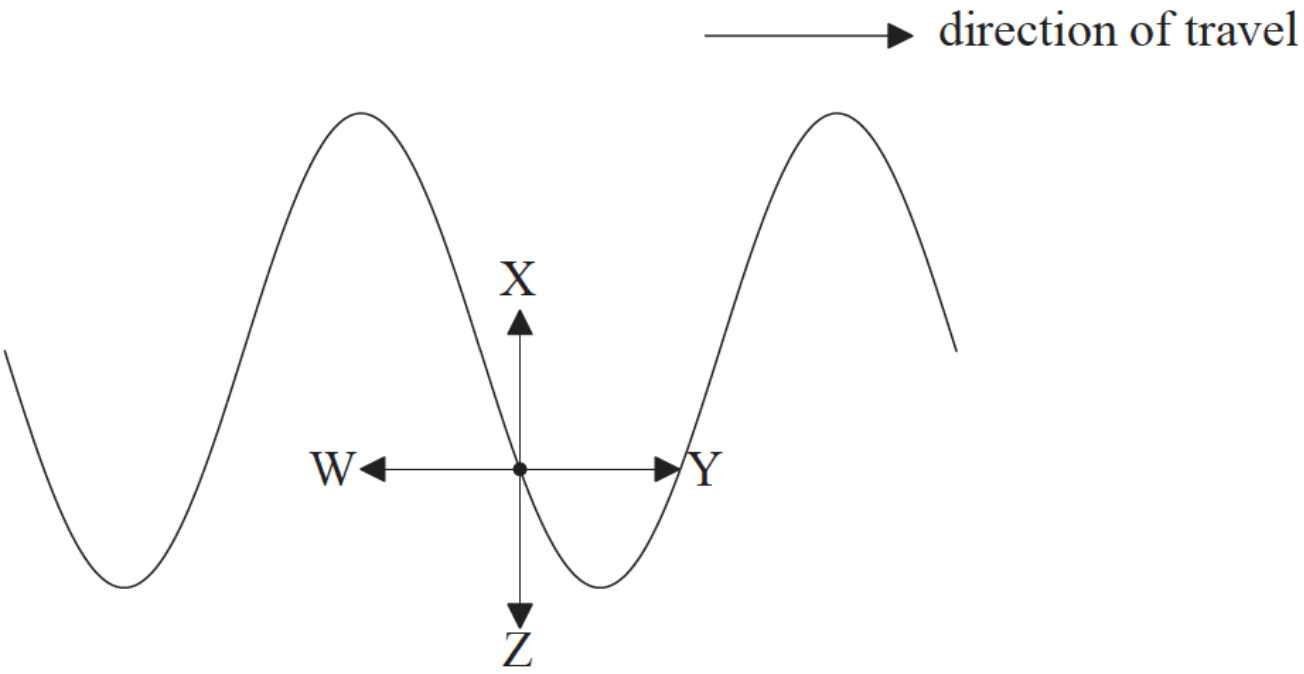
The waves leaving L_1 and L_2 are in phase and are observed at points P and Q.

The wavelength of the sound is 0.60 m. The distances of points P and Q from the loudspeakers are shown in the diagram.

Which of the following is true about the intensity of the sound at P and the intensity of the sound at Q?

	Intensity at P	Intensity at Q
A.	maximum	maximum
B.	maximum	minimum
C.	minimum	maximum
D.	minimum	minimum

6. The diagram shows, at a particular instant in time, part of a rope along which a wave is travelling. *[1 mark]*



The wave is travelling from left to right.

Which arrow shows the direction of motion of the rope at the point shown?

A. W

B. X

C. Y

D. Z

7. For a body undergoing simple harmonic motion the velocity and acceleration are *[1 mark]*

A. always in the same direction.
B. always in opposite directions.
C. in the same direction for a quarter of the period.
D. in the same direction for half the period.

8. Which of the following correctly relates the direction of oscillation of the particles in a medium to the direction of energy propagation for transverse and longitudinal waves? *[1 mark]*

	Transverse wave	Longitudinal wave
A.	perpendicular	perpendicular
B.	perpendicular	parallel
C.	parallel	perpendicular
D.	parallel	parallel

9. Two identical waves of wavelength λ leave two sources in phase. The waves meet and superpose after travelling different distances. Which path difference will result in destructive interference? *[1 mark]*

A. $\frac{\lambda}{4}$

B. $\frac{\lambda}{2}$

C. $\frac{3\lambda}{4}$

D. λ

10. The acceleration of an object executing simple harmonic motion is proportional to the *[1 mark]*

A. displacement of the object from equilibrium.

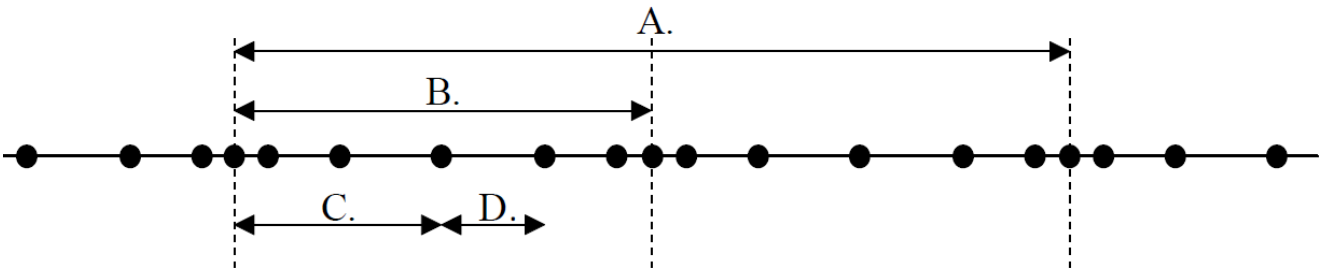
B. velocity of the object.

C. amplitude of oscillation.

D. frequency of oscillation.

11. Gas particles are equally spaced along a straight line. A sound wave passes through the gas. The positions of the gas particles at one instant are shown below. *[1 mark]*

Which of the distances shown is equal to the wavelength of the wave?



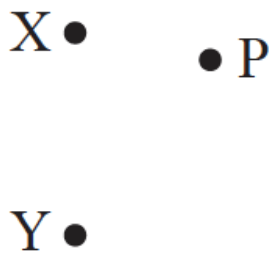
12. Light of wavelength 600 nm travels from air to glass at normal incidence. *[1 mark]*
The refractive index of the glass is 1.5. The speed of light in air is c.
Which of the following correctly identifies the speed of the waves and their wavelength in the glass?

	Speed	Wavelength
A.	$\frac{2c}{3}$	900 nm
B.	c	900 nm
C.	c	400 nm
D.	$\frac{2c}{3}$	400 nm

13. Which of the following correctly describes the direction of a ray drawn relative to a wavefront for longitudinal and transverse waves? *[1 mark]*

	Longitudinal wave	Transverse wave
A.	parallel	parallel
B.	parallel	perpendicular
C.	perpendicular	parallel
D.	perpendicular	perpendicular

14. Waves emitted from sources X and Y have equal wavelengths and are initially in phase. The waves interfere destructively at point P, where the path difference is 0.60m. *[1 mark]*



What is a possible value for the wavelength of the waves?

A. 0.20 m
B. 0.30 m
C. 0.40 m
D. 0.60 m

15. The intensity of radiation from a star at the surface of one of its planets is *I*. The distance between the star and the planet is *d*. *[1 mark]*

What is the intensity at the surface of another planet which is a distance $\frac{d}{4}$ from the star?

A. 4*I*
B. 8*I*
C. 16*I*
D. 64*I*

16. What region of the electromagnetic spectrum includes waves of wavelength 5×10^{-8} m? *[1 mark]*

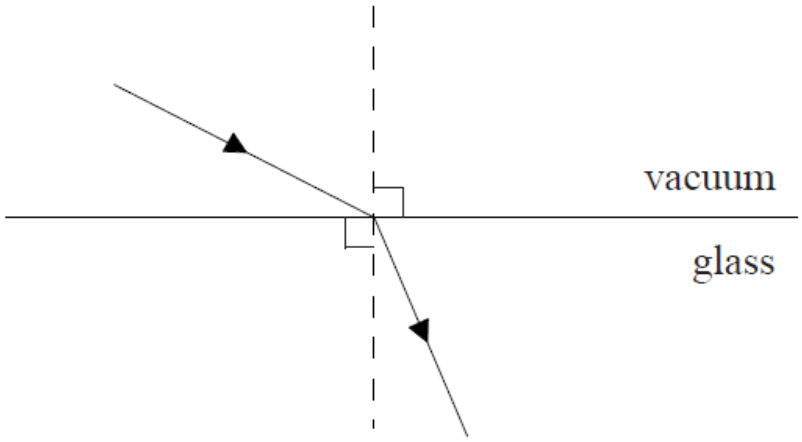
A. X-ray

B. Ultraviolet

C. Infrared

D. Microwave

17. A ray of light travels from a vacuum into glass as shown below. *[1 mark]*



In glass, light has speed *v*. In a vacuum, light has speed *c*. Which of the following gives the refractive index of glass?

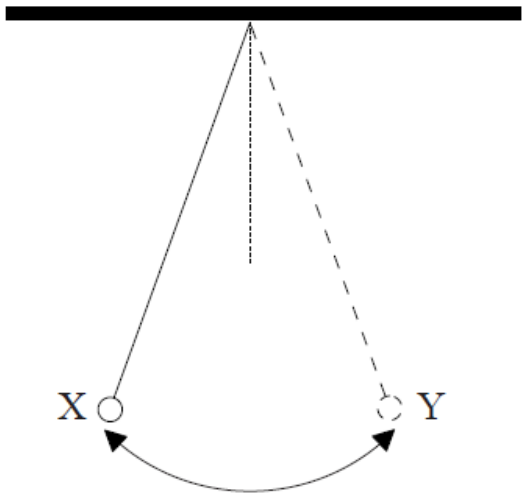
A. $\frac{c}{v}$

B. $\frac{v}{c}$

C. $\frac{\sin c}{\sin v}$

D. $\frac{\sin v}{\sin c}$

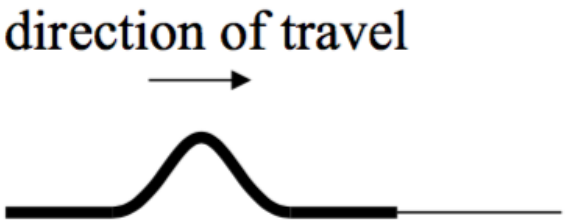
18. A pendulum swings back and forth in a circular arc between X and Y. *[1 mark]*



The pendulum bob is

A. always in equilibrium.
B. only in equilibrium at X and Y.
C. in equilibrium as it passes through the central position.
D. never in equilibrium.

19. A wave pulse is travelling along a dense thick rope which is connected to a less dense thin rope. *[1 mark]*



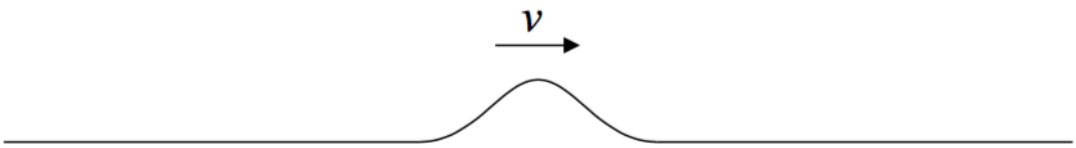
Which of the following is correct regarding the reflected and transmitted wave pulses after the wave pulse reaches the connection of the two ropes?

	Reflected pulse	Transmitted pulse
A.	inverted	inverted
B.	not inverted	inverted
C.	inverted	not inverted
D.	not inverted	not inverted

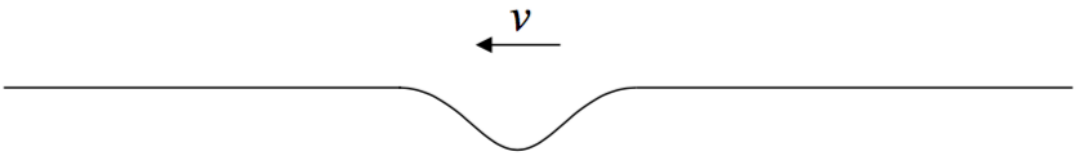
20. Two wave pulses travel along a string towards each other. The diagram shows their positions at a moment in time. *[1 mark]*

Which of the following shows a possible configuration of the pulses at a later time?

A.



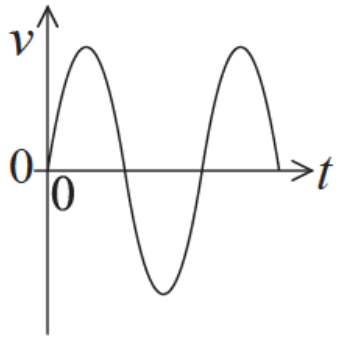
B.



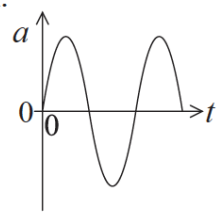
C.

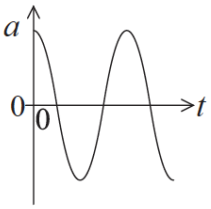
D.

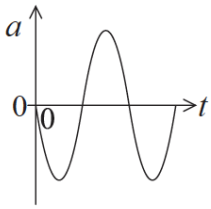
21. The diagram shows the variation of velocity v with time t for an object performing simple harmonic motion. *[1 mark]*

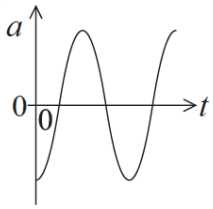


Which of the following shows how the acceleration a varies with t?

A.


B.


C.


D.


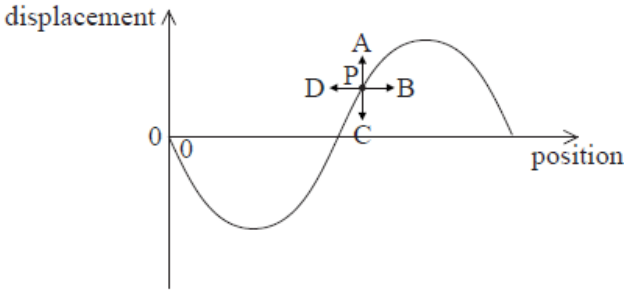
22. Which of the following gives regions of the electromagnetic spectrum in the order of **decreasing** frequency? *[1 mark]*

A. gamma-ray, microwave, visible
B. radio wave, infrared, microwave
C. ultraviolet, infrared, microwave
D. visible, gamma-ray, radio wave

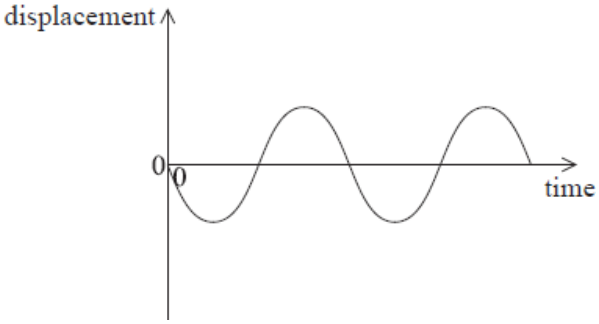
23. The power emitted as electromagnetic radiation by the Sun is approximately 4×10^{26} W. The radius of the orbit of Mars around the Sun is approximately 2×10^{11} m. What is the best estimate for the power incident on an area of 1 m^2 at the radius of Mars' orbit? *[1 mark]*

A. 10^3 W
B. 10^7 W
C. 10^{11} W
D. 10^{15} W

24. A transverse wave travels from left to right. The diagram below shows how, at a particular instant of time, the displacement of particles in the medium varies with position. Which arrow represents the direction of the velocity of the particle marked P? *[1 mark]*

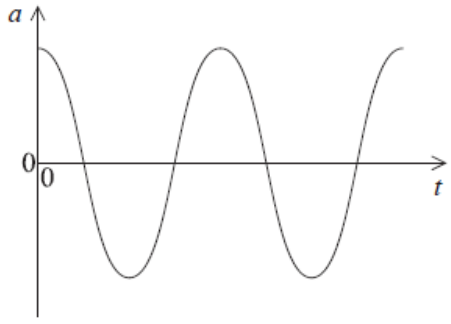


25. The graph shows how the displacement varies with time for an object undergoing simple harmonic motion. *[1 mark]*

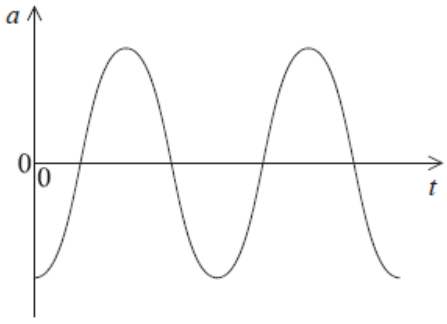


Which graph shows how the object's acceleration *a* varies with time *t*?

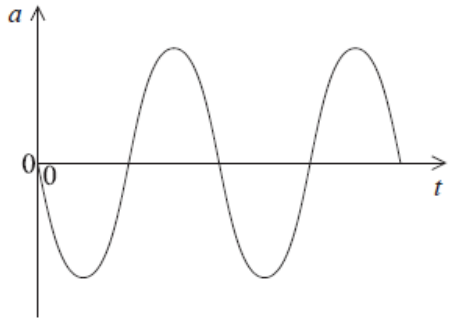
A.



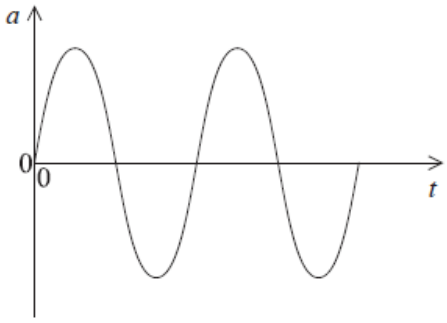
B.



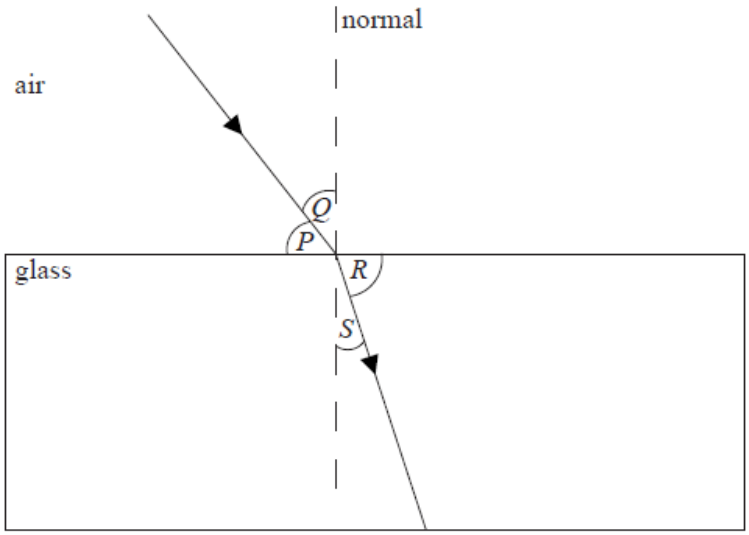
C.



D.



26. Light travels from air into glass as shown below. *[1 mark]*



What is the refractive index of glass?

A. $\frac{\sin P}{\sin S}$

B. $\frac{\sin Q}{\sin R}$

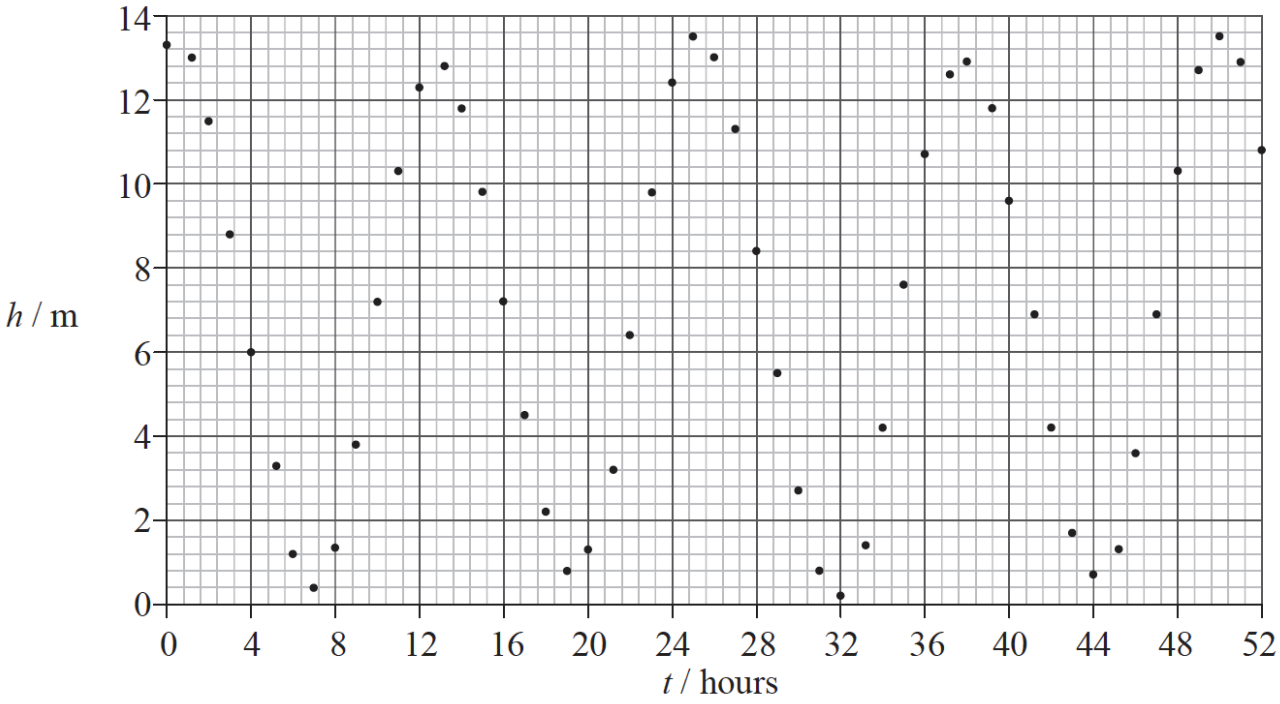
C. $\frac{\sin P}{\sin R}$

D. $\frac{\sin Q}{\sin S}$

27. Which of the following electromagnetic waves has a frequency **greater** than that of visible light? *[1 mark]*

A. Ultraviolet
B. Radio
C. Microwaves
D. Infrared

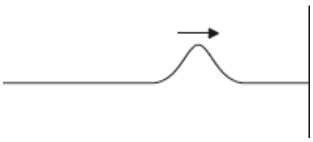
28. The graph shows measurements of the height h of sea level at different times t in the Bay of Fundy. *[1 mark]*



Which of the following gives the approximate amplitude and period of the tides?

	Amplitude	Period
A.	6.5 m	6 hours
B.	13 m	12 hours
C.	6.5 m	12 hours
D.	13 m	6 hours

29. One end of a horizontal string is fixed to a wall. A transverse pulse moves along the string as shown. *[1 mark]*



Which of the following statements are correct for the reflected pulse compared to the forward pulse?

I. It moves more slowly.

II. It has less energy.

III. It is inverted.

A. I and II only

B. I and III only

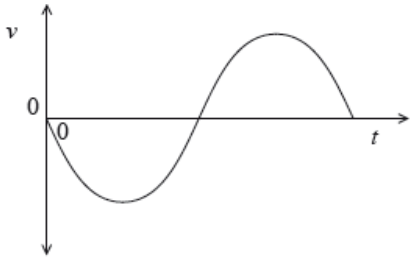
C. II and III only

D. I, II and III

30. Monochromatic light travels from air into water. Which of the following describes the changes in wavelength and speed? *[1 mark]*

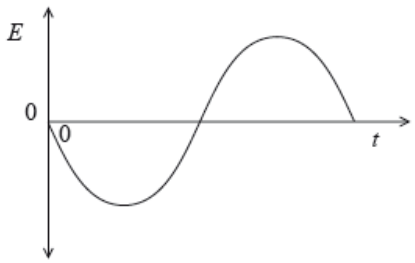
	Wavelength	Speed
A.	increases	decreases
B.	increases	increases
C.	decreases	increases
D.	decreases	decreases

31. The graph shows how the velocity v of an object undergoing simple harmonic motion varies with time t for one complete period of oscillation. *[1 mark]*

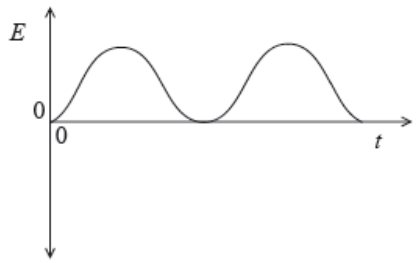


Which of the following sketch graphs best shows how the total energy E of the object varies with t?

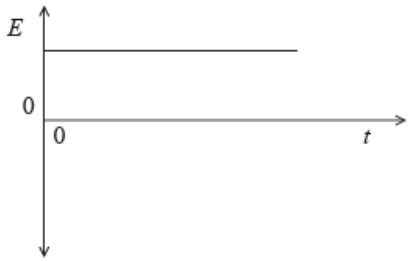
A.



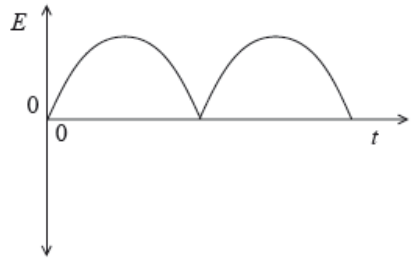
B.



C.



D.



32. Which of the following is a value of wavelength that is found in the visible region of the electromagnetic spectrum? *[1 mark]*

A. $4 \times 10^{-5}\ \mathrm{m}$

B. $4 \times 10^{-7}\ \mathrm{m}$

C. $4 \times 10^{-9}\ \mathrm{m}$

D. $4 \times 10^{-11}\ \mathrm{m}$

33. Two waves meet at a point in space. Which of the following properties always add together? *[1 mark]*

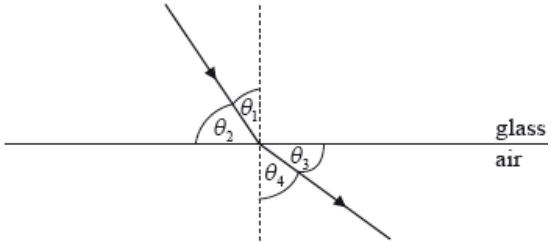
A. Displacement

B. Amplitude

C. Speed

D. Frequency

34. A ray of light is incident on a boundary between glass and air. *[1 mark]*



Which of the following is the refractive index of glass?

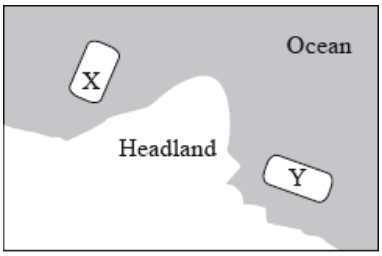
A. $\frac{\sin\theta_1}{\sin\theta_3}$

B. $\frac{\sin\theta_1}{\sin\theta_4}$

C. $\frac{\sin\theta_3}{\sin\theta_2}$

D. $\frac{\sin\theta_4}{\sin\theta_1}$

35. An orchestra playing on boat X can be heard by tourists on boat Y, which is situated out of sight of boat X around a headland. *[1 mark]*



The sound from X can be heard on Y due to

A. refraction.

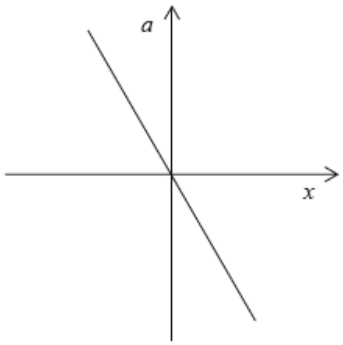
B. reflection.

C. diffraction.

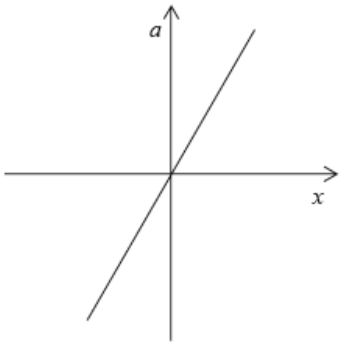
D. transmission.

36. Which graph correctly shows how the acceleration, a of a particle undergoing SHM varies with its displacement, x from its equilibrium position? *[1 mark]*

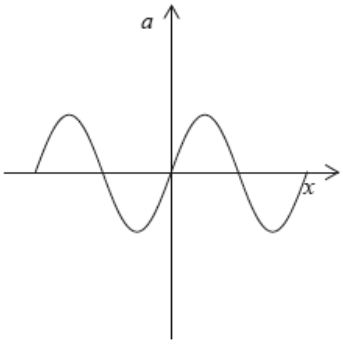
A.



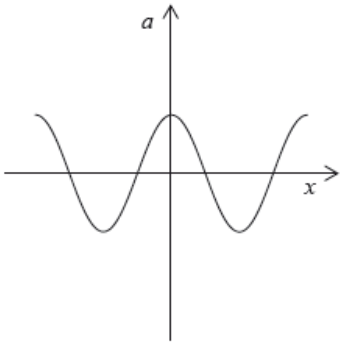
B.



C.



D.



37. In which of the following regions of the electromagnetic spectrum is radiation of wavelength 600 nm located? *[1 mark]*

A. microwaves

B. radio waves

C. visible light

D. X-rays

38. What is the best estimate for the refractive index of a medium in which light travels at a speed of $2.7 \times 10^8\ \mathrm{m\,s^{-1}}$? *[1 mark]*

A. 0.9

B. 1.0

C. 1.1

D. 2.7