PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

WAVES AND ACOUSTICS

Travelling Waves

1. At t=0,a transverse wave pulse travelling in the positive x direction with a speed of $2m/s$ in a wire is described by the function

$y = 6/x^2$ given that $x \neq 0$. Transverse velocity of a particle at x=2 m and t= 2 s is

A. $3m/s$

B. $-3m/s$

C. $8m/s$

D. $-8m/s$

Answer: B

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2. A wave travelling in positive X-direction with $A = 0.2m$ has a velocity of $36m/\sec$ if $\lambda = 60m$, then correct expression for the wave is

A. $y = 0.2\sin\left[2\pi\left(6t + \frac{x}{60}\right)\right]$

B. $y = 0.2\sin\left[\pi\left(6t + \frac{x}{60}\right)\right]$

C. $y = 0.2\sin\left[2\pi\left(6t - \frac{x}{60}\right)\right]$

D. $y = 0.2\sin\left[\pi\left(6t - \frac{x}{60}\right)\right]$

Answer: C

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3. The equation $y = A\cos^2\left(2\pi nt - 2\pi\frac{x}{\lambda}\right)$ represents a wave with

A. Amplitude $A/2$, frequency $2n$ and wavelength $\frac{\lambda}{2}$

B. Amplitude $A/2$ frequency $2n$ and wavelength λ

C. Amplitude A , frequency $2n$ and wavelength 2λ

D. Amplitude A, frequency n and wavelength λ

Answer: A

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4. The path difference between the two waves $y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$ and $y_2 = a_2 \cos\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right)$ is

A. $\frac{\lambda}{2\pi}\phi$

B. $\frac{\lambda}{2\pi}\left(\phi+\frac{\pi}{2}\right)$

C. $\frac{2\pi}{\lambda}\left(\phi-\frac{\pi}{2}\right)$

D. $\frac{2\pi}{\lambda}\phi$

Answer: B

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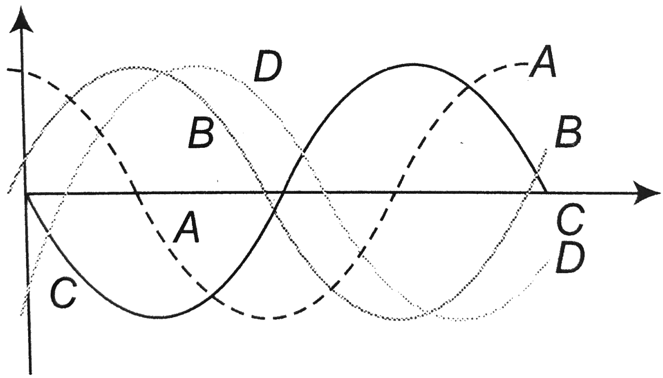
5. Which of the following curves represents correctly the oscillation given by

$y = y_0 \sin(\omega t - \phi)$ where $0 < \phi < 90^\circ$?



A. A

B. B

C. C

D. D

Answer: D

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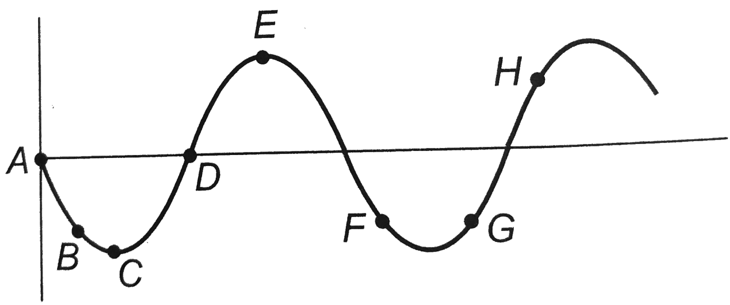
6. The diagram below shows the propagation of a wave. Which points are in same phase?



A. F and G

B. C and F

C. B and G

D. B and F

Answer: D

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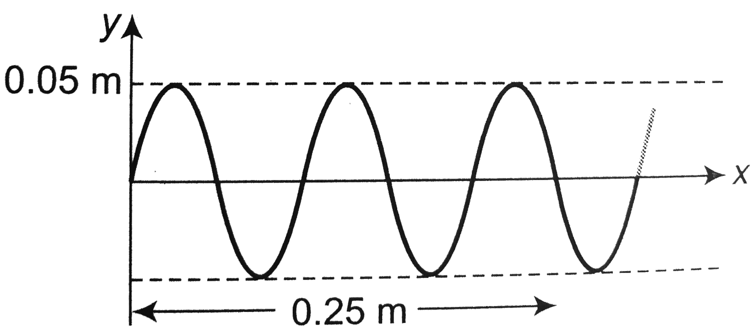
7. 

If the speed of the wave shown in the figure is $330m/s$ in the given medium then the equation of the wave propagating in the positive x-direction will be (all quantities are in M.K.S units)

A. $y=0.05\sin 2\pi(4000t-12.5x)$

B. $y=0.05\sin 2\pi(4000t-122.5x)$

C. $y=0.05\sin 2\pi(3300t-10x)$

D. $y=0.05\sin 2\pi(3300x-10t)$

Answer: C

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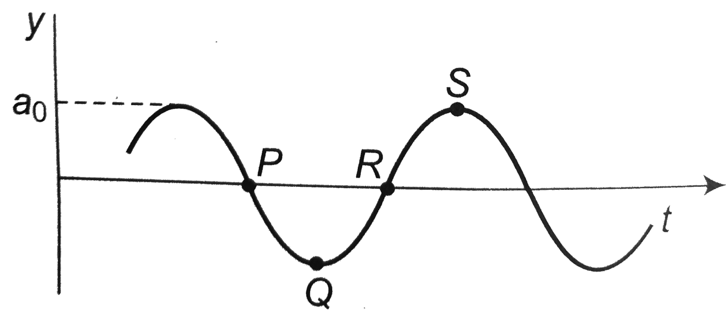
8.



A wave motion has the function $y = a_0 \sin(\omega t - kx)$. The graph in figure shows how the displacement y at a fixed point varies with time t. Which one of the labelled points Shows a displacement equal to that at the position $x = \frac{\pi}{2k}$ at time $t = 0$?

A. P

B. Q

C. R

D. S

Answer: B

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9. A sine wave of wavelength λ is travelling in a medium. The minimum distance between the two particles always having same speed is

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

B. $\frac{\lambda}{3}$

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

D. λ

Answer: C

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10. If the frequency of a wave is increased by 25%, then the change in its wavelength will be: (medium not changed)

A. 20% increase

B. 20% decrease

C. 25% increase

D. 25% decrease

Answer: B

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11. Two small boats are $10m$ apart on a lake. Each pops up and down with a period of 4.0 seconds due to wave motion on the surface of water. When one boat is at its highest point, the other boat is its lowest point. Both boats are always within a single cycle of the waves. The speed of the waves is:

A. $2.5m / s$

B. $5.0m / s$

C. $14m / s$

D. $40m / s$

Answer: B

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12. The equation of a wave is given by (all quantity expressed in S.I units) $y = 5\sin 10\pi(t - 0.01x)$ along the x-axis. The magnitude of phase difference between the points separated by a distance of 10 m along x-axis is

A. $\pi / 2$

B. π

C. 2π

D. $\pi / 4$

Answer: B

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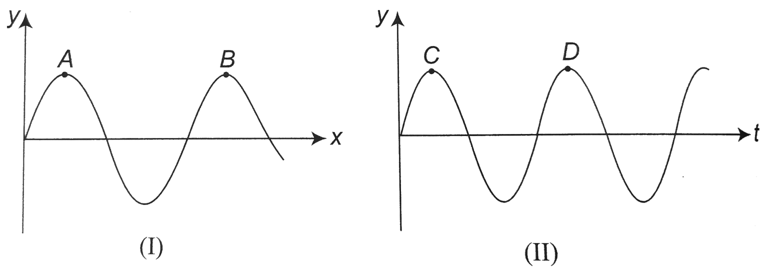
13. 

The same progressive wave is represented by two graphs I and II. Graph I shows how the displacement y varies with the distance x along the wave at a given time. Graph II shows how y varies with time t at a given point on the wave. The ratio of measurements AB to CD, marked on the curves represents:

A. wave number k

B. wave speed v

C. frequency v

D. angular frequency ω

Answer: B

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14. $y(x,t)=\dfrac{1.0}{\left[(ax+bt)^2+(cx+dt)^2+5\right]}$

represents a moving pulse where x and y are in metres and t in seconds. It has speed of pulse b/a. Find the correct option.

A. $bc=ad$

B. $bd=ac$

C. $ab=cd$

D. none of these

Answer: A

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15. As the wave propagates, choose the incorrect statement.

A. the wave intensity remains constant for a plane curve

B. the wave intensity decreases as the inverse of the distance from the source for a spherical wave

C. the wave intesity decreases as the inverse square of the distance from the source for a spherical wave

D. the wave intensity decreases as the inverses of the distance for a line source.

Answer: B

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16. Instantaneous profile of a rope carrying a progressive wave moving from left to right is shown, Find the correct option:

A. Both P and Q are moving upwards

B. Both P and Q are moving downwards

C. P is moving upwards and Q is moving downwards

D. P is moving downwards and Q is moving upwards

Answer: D

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17. The string of length L is stretched by x when the speed of transverse wave along it is v_1. The string is further stretched by Δx when the speed of transverse wave along it is $v_1\sqrt{2}$. Find Δx:

A. $(\sqrt{2}-1)x$

B. $x\sqrt{2}$

C. x

D. $(\sqrt{2}+1)x$

Answer: C

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18. The phase difference between two displacements at a certain point A at time 10^{-3} sec apart is π. Find the distance between point A and B, which is 60° out of phase than point A. If wave velocity is x:

A. $1.33 \times 10^{-3}x$

B. $0.33 \times 10^{-4}x$

C. $2.33 \times 10^{-4}x$

D. $3.33 \times 10^{-4}x$

Answer: D

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Equation And Energy Of Progressive Wave

1. A transverse wave is propagating along $+x$ direction. At $t=2$ sec the particle at $x=4$m is at $y=2$ mm. With the passage of time its y coordinate increases and reaches to a maximum of 4 mm. The wave equation is (using ω and k with their usual meanings)

A. $y=4\sin\left[\omega(t+2)+k(x-2)+\frac{\pi}{6}\right]$

B. $y=4\sin\left[\omega(t+2)+k(x)+\frac{\pi}{6}\right]$

C. $y=4\sin\left[\omega(t-2)-k(x-4)+\frac{5\pi}{6}\right]$

D. $y=4\sin\left[\omega(t-2)-k(x-4)+\frac{\pi}{6}\right]$

Answer: D

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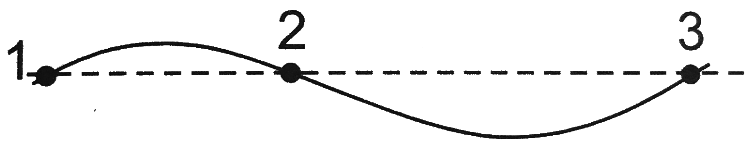
2. 

The diagram below shows an instantaneous position of a string as a transverse progressive wave travels along it from left to right Which one of the following correctly shows the direction of the velocity of the points 1,2 and 3 on the string?

A. $\rightarrow \quad \rightarrow \quad \rightarrow$

B. $\rightarrow \quad \leftarrow \quad \rightarrow$

C. $\downarrow \quad \downarrow \quad \downarrow$

D. $\downarrow \quad \uparrow \quad \downarrow$

Answer: D

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3.

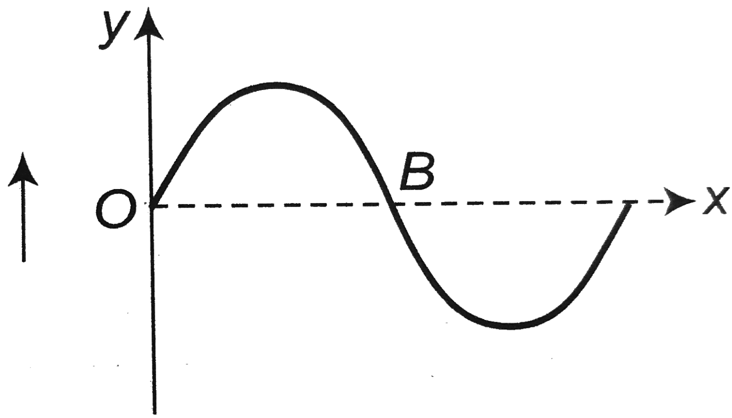

Figure below shows the wave $y = A\sin(\omega t - kx)$ at any instant travelling in the $+ve$ x-direction. What is the slope of the curve at B?

A. ω / A

B. k / A

C. kA

D. ωA

Answer: C

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4. The equation of a transverse travelling on a rope is given by $y = 10 \sin \pi(0.01x - 2.00t)$ where y and x are in cm and t in seconds. The maximum transverse speed of a particle in the rope is about

A. $63cm / s$

B. $75cm / s$

C. $100cm / s$

D. $121cm / s$

Answer: A

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5. A transverse wave is represented by the equation

$$y = y_0 \sin. \frac{2\pi}{\lambda}(vt - x)$$

For what value of λ, the maximum particle velocity equal to two times the wave velocity?

A. $\lambda = 2\pi y_0$

B. $\lambda = \pi y_0 / 3$

C. $\lambda = \pi y_0 / 2$

D. $\lambda = \pi y_0$

Answer: D

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6. A transverse periodic wave on a string with a linear mass density of $0.200 kg/m$ is described by the following equation $y = 0.05 \sin(420t - 21.0x)$ Where x and y are in metres and t is in seconds. The tension in the string is equal to

A. $32N$

B. $42N$

C. $66N$

D. $80N$

Answer: D

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7. The displacement from the position of equilibrium of a point 4 cm from a source of sinusoidal oscillations is half the amplitude at the moment $t = T/6$ (T is the time perios). Assume that the source was at mean position at $t = 0$. The wavelength of the running wave is :

A. $0.96cm$

B. $0.48cm$

C. $0.24cm$

D. $0.12cm$

Answer: B

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8. A wave moving with constant speed on a uniform string passes the point $x = 0$ with amplitude A_0, angular frequency ω_0 and average rate of energy transfer P_0. As the wave travels down the string it gradually loses energy and at the point $x = l$, the average rate of energy transfer becomes half. At the point $x = l$. Angular frequency and amplitude are respectively:

A. ω_0 and $\frac{A_0}{\sqrt{2}}$

B. $\frac{\omega_0}{\sqrt{2}}$ and A_0

C. less than ω_0 and A_0

D. $\frac{\omega_0}{\sqrt{2}}$ and $\frac{A_0}{\sqrt{2}}$

Answer: A

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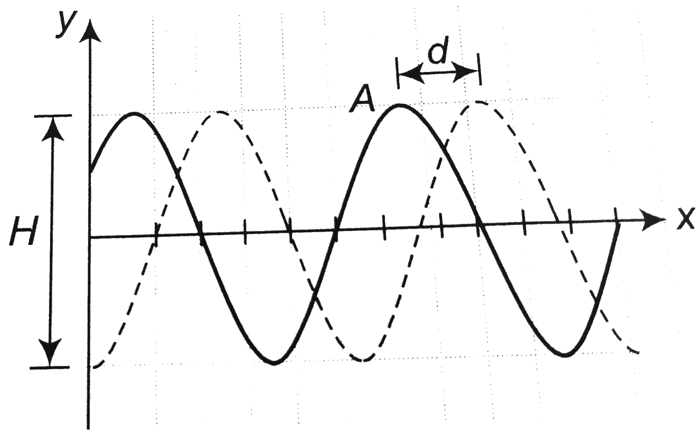
9. 

A sinusoidal wave moving along a string is shown twice in the figure. As crest A travels in the positive direction of an x axis by distance $d = 6.0$ cm in $4.0m$. The tick marks along the axis are separated by $10cm$, height $H = 6.00mm$. The wave equation is

A. $y = (3mm)\sin\left[16x - 2.4 \times 10^2 t\right]$

B. $y = (3mm)\sin\left[16x + 2.4 \times 10^2 t\right]$

C. $y = (3mm)\sin\left[8x + 2.4 \times 10^2 t\right]$

D. $y = (3mm)\sin\left[8x - 2.4 \times 10^2 t\right]$

Answer: A

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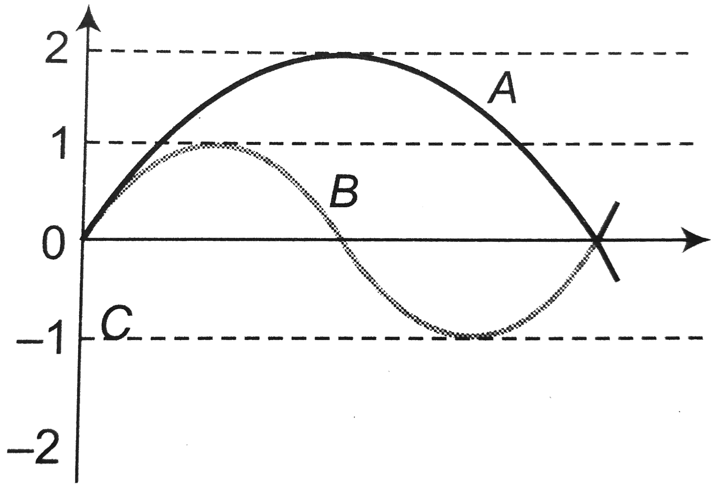
10. 

The displacement time graph for two sound waves A and B are shown in the figure. Then the ratio of their intensities I_A / I_B is equal to

A. $1:4$

B. $1:16$

C. $1:2$

D. $1:1$

Answer: D

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11. In the given progressive wave equation $y = 0.5\sin(10\pi t - 5x)$ where x,y in cm and t in second. The maximum velocity of the particle is :

A. $5cm/s$

B. $5\pi cm / s$

C. $10 cm / s$

D. $10.5 cm / s$

Answer: B

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12. A transverse wave described by equation $y = 0.02 \sin(x + 30t)$ (where x and t are in meters and seconds, respectively) is travelling along a wire of area of cross-section $1 mm^2$

and density $8000 kg/m^3$. What is the tension in the string?

A. $20N$

B. $7.2N$

C. $30N$

D. $14.4N$

Answer: B

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13. A $100Hz$ sinusoidal wave is travelling in the positive x-direction along a string with a linear mass density of $3.5 \times 10^{-3} kg/m$ and a tension of $35N$. At time $t = 0$, the point $x = 0$, has maximum displacement in the positive y-direction. Next when this point has zero displacement, the slope of the string is $\pi/20$. Which of the following expression represent (s) the displacement of string as a function of x(in metre) and t (in second)

A. $y = 0.025 \sin\left(200\pi t - 2\pi x + \frac{\pi}{4}\right)$

B. $y = 0.025 \sin\left(2\pi x - 200\pi t + \frac{\pi}{2}\right)$

C. $y = 0.025 \sin\left(2\pi x - 200\pi t + \frac{\pi}{4}\right)$

D. $y = 0.025 \sin\left(200\pi t - 2\pi x + \frac{\pi}{2}\right)$

Answer: D

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14. Sinusoidal waves $5.00cm$ in amplitude are to be transmitted along a string having a linear mass density equal to $4.00 \times 10^{-2} kg/m$. If the source can deliver a maximum power of $90W$ and the string is under a tension of $100N$, then the highest frequency at which the source can operate is (take $\pi^2 = 10$)

A. $45.3Hz$

B. $50Hz$

C. $30Hz$

D. $62.3Hz$

Answer: C

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15. A transverse wave is passing through a stretched string with a speed of $20m/s$. The tension in the string is $20N$. At a certain point P on the string. It is observed that energy is being transferred at a rate of $40mW$ at a given instant. Find the speed of point P.

A. $40cm/s$

B. $20cm/s$

C. $2mm/s$

D. $20mm/s$

Answer: B

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16. The pressure variation that correspond to pain threshold (i.e., the ear can tolerate in loud sound) is about 30 Pa. velocity of sound in water is $\sqrt{2} \times 10^3 m / s$. The intensity of sound wave produced in water corresponding to loud sound is

A. $1W / m^2$

B. $0.3 \times 10^{-3} W / m^2$

C. $10^3 W / m^2$

D. $10^{-12} W / m^2$

Answer: B

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Superposition And Interference

1. Two sources of sound A and B produces the wave of $350 Hz$. They vibrate in the same phase. The particle P is vibrating under the influence of these two waves, if the amplitudes at the point P produced by the two waves is $0.3mm$ and $0.4mm$ then the resultant amplitude of the point P will be when $AP - BP = 25cm$ and the velocity of sound is $350m/\sec$.

A. $0.7mm$

B. $0.1mm$

C. $0.2mm$

D. $0.5mm$

Answer: D

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2. Two waves are propagating to the point P along a straight line produced by two sources A and B of simple harmonic and of equal frequency. The amplitude of every wave at P is a and the phase of A is ahead by $\pi/3$ than that of B and the distance AP is greater than BP by $50cm$. Then the resultant amplitude at the point P will be if the wavelength is 1 meter

A. $2a$

B. $a\sqrt{3}$

C. $a\sqrt{2}$

D. a

Answer: D

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3. The minimum intensity of sound is zero at a point due to two sources of nearly equal frequencies when

A. two sources are vibrating in opposite phase

B. The amplitude of two sources are equal

C. at the point of observation, the amplitudes of two S.H.M. produced by two sources are equal and both the S.H.M. are along the same straight line

D. Both the sources are in the same phase

Answer: C

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4. Out of given four waves (1),(2),(3) and (4)

$y = a\sin(kx + \omega t)$ ..(1)

$y = a\sin(\omega t - kx)$ ..(2)

$y = a\cos(kx + \omega t)$ ..(3)

$y = a\cos(\omega t - kx)$ ..(4)

emitted by four different source S_1,S_2,S_3 and S_4 respectively, interference phenomena would be observed in space under appropriate conditions when

A. Source S_1 emits wave (1) and S_2 emits wave (2)

B. Source S_3 emits wave (3) and S_4 emits wave (4)

C. Source S_2 emits wave (2) and S_4 emits wave (4)

D. S_4 emits waves (4) and S_3 emits waves (3)

Answer: C

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5. Equation of motion in the same direction is given by $y_1 = A\sin(\omega t - kx)$, $y_2 = A\sin(\omega t - kx - \theta)$. The amplitude of the medium particle will be

A. $2A\cos.\dfrac{\theta}{2}$

B. $2A\cos\theta$

C. $\sqrt{2}A\cos.\dfrac{\theta}{2}$

D. $1.2f$,1.2λ

Answer: A

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6. The amplitude of a wave represented by displacement equation $y=\frac{1}{\sqrt{a}}\sin\omega\pm\frac{1}{\sqrt{b}}\cos\omega t$ will be

A. $\frac{a+b}{ab}$

B. $\frac{\sqrt{a}+\sqrt{b}}{ab}$

C. $\frac{\sqrt{a}\pm\sqrt{b}}{ab}$

D. $\sqrt{\frac{a+b}{ab}}$

Answer: D

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7. Two waves having equations

$x_1 = a \sin(\omega t + \phi_1), x_2 = a \sin(\omega t + \phi_2)$

If in the resultant wave the frequency and amplitude remain equal to those of superimposing waves. Then phase difference between them is

A. $\frac{\pi}{6}$

B. $\frac{2\pi}{3}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{3}$

Answer: B

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8. A wave travels on a light string. The equation of the wave is $Y = A\sin(kx - \omega t + \theta))$. It is reflected from a heavy string tied to an end of the light string at $x = 0$. If 64% of the incident energy is reflected the equation of the reflected wave is

A. $y = 0.5A\sin(kx + \omega t + \theta)$

B. $y' = -0.5A\sin(kx + \omega t + \theta)$

C. $y' = -0.5A\sin(\omega t - kx - \theta)$

D. $y' = -0.5A\sin(kx + \omega t - \theta)$

Answer: D

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9. In a large room, a person receives direct sound waves from a source 120 meters away from him. He also receives waves from the same source which reach him, being reflected from the 25 meter high ceiling at a point halfway between them. The two waves interfere constuctively for wavelength of

A. $20, 20/3 etc$

B. $10, 5, 2.5 etc$

C. $10, 20, 30 etc$

D. $15, 25, 35 etc$

Answer: A

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10. Two speakers connected to the same source of fixed frequency are placed 2.0m apart in a box. A sensitive microphone placed at a distance of 4.0 m from their midpoint along the perpendicular bisector shows maximum response. The box is slowly rotated until the speakers are in line with the microphone. The distance between the midpoint of the speakers and the microphone remains unchanged. Exactly five maximum responses are observed in the microphone in doing this. the wavelength of the sound wave is

A. $0.2m$

B. $0.4m$

C. $0.6m$

D. $0.8m$

Answer: B

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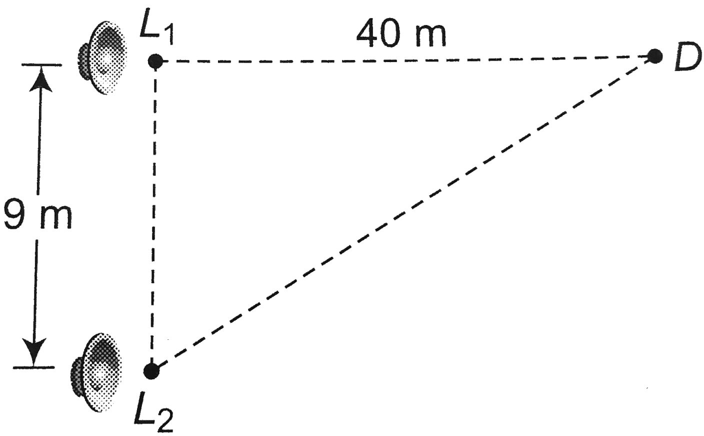
11. 

Two loudspeakers L_1 and L_2 driven by a common oscillator and amplifier, are arranged as shown. The frequency of the oscillator is gradually increased from zero and the detector at D records a series of maxima and minima. If the speed of sound is $330ms^{-1}$

then the frequency at which the first maximum is observed is

A. $165Hz$

B. $330Hz$

C. $496Hz$

D. $660Hz$

Answer: B

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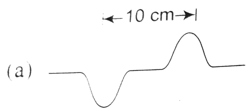
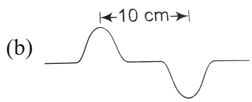
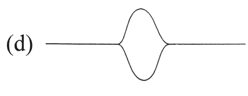
12. Two pulses travel in mutually opposite directions in a string with a speed of $2.5cm/s$ as shown in the figure. Initially the pulses are $10cm$ apart. What will be the state of the string after two seconds?

A. 

B. 

C. 

D. 

Answer: C

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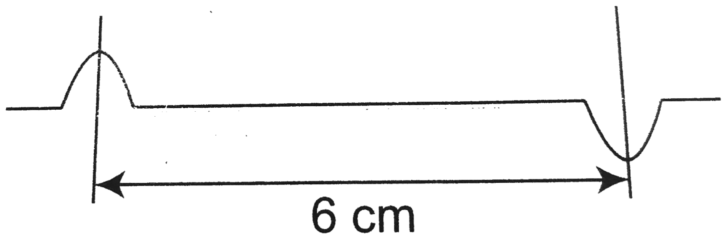
13. 

Two pulses are travelling along a string in opposite directions towards each other as shown in the figure. If the wave velocity is $2cm/s$ and the pulses are 6 cm apart, then after $1.5 \sec$, the energy stored in the string will be (Assume shapes of pulses to be similar)

A. kinetic energy only

B. potential energy only

C. kinetic energy as well as potential energy

D. none of these

Answer: A

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14. There are 10 sound sources each producing intensity I at a point independently. They are incoherent. Average intensity of sound at that point will be:

A. I

B. $10I$

C. $100I$

D. 0

Answer: B

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15. Two coherent sources of different intensities send waves which interfere. The ratio of maximum intensity to the minimum intensity is 25. The intensities of the sources are in the ratio

A. $25 : 1$

B. $6 : 1$

C. $9 : 4$

D. $625 : 1$

Answer: C

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16. A string fixed at both ends has consecutive standing wave modes for which the distances between adjacent nodes are 18 cm and 16 cm respectively. The minimum possible length of the string (in cm) is:

A. 144

B. 152

C. 176

D. 200

Answer: A

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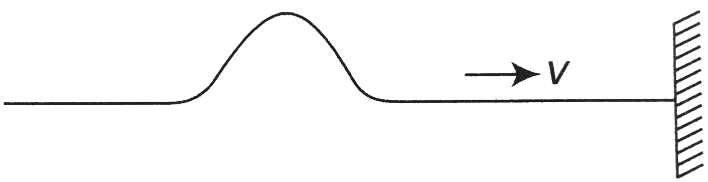

17. When a wave pulse travelling in a string is reflected from rigid wall to which string is tied as shown in figure. For this situation two statements are given below.

(1) The reflected pulse will be in same orientation of incident pulse due to a phase change of π radians

(2) During reflection the wall exert a force on string in upward direction

A. Only (1) is true

B. only (2) is true.

C. Both are true

D. both are wrong

Answer: D

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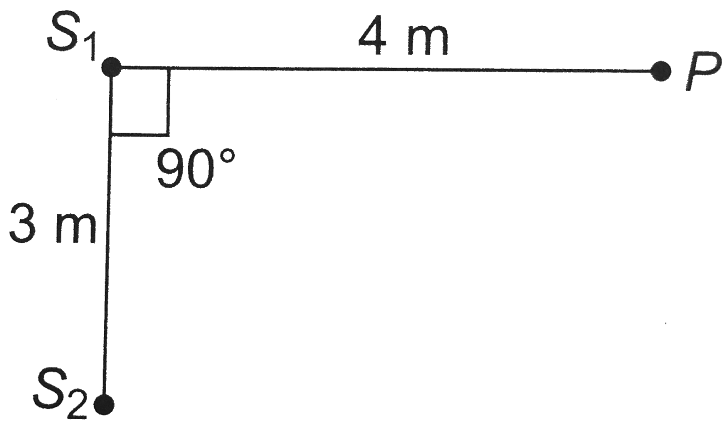
18. 

S_1 and S_2 are two coherent sources of sound of frequency $110Hz$ each they have no initial phase difference. The intensity at a point P due to S_1 is I_0 and due to S_2 is $4I_0$. If the velocity of sound is $330 m / s$ then the resultant intensity at P is

A. I_0

B. $9 I_0$

C. $3 I_0$

D. $8 I_0$

Answer: C

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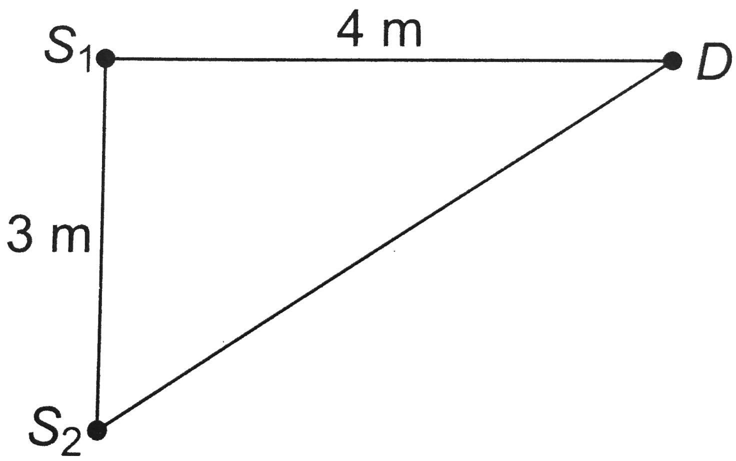
19.



In the figure the intensity of waves arriving at D from two coherent sources S_1 and S_2 is I_0

The wavelength of the wave is $\lambda = 4m.$

Resultant intensity at D will be:

A. $4I_0$

B. I_0

C. $2I_0$

D. zero

Answer: C

Watch Video Solution

20. Two interfering waves have intensities in the ratio $9:1$. Then the ratio of maximum to minimum intensity is:

A. $10:8$

B. $4:2$

C. $100:64$

D. $16:4$

Answer: D

Watch Video Solution

21. The difference of loudness in decibels (dB) between maximum and minimum intensities of two coherent sound sources as they interfere in space is $20 \log 3$. Find the ratio of intensities of two coherent sound sources:

A. 2

B. 4

C. $4\sqrt{2}$

D. 8

Answer: B

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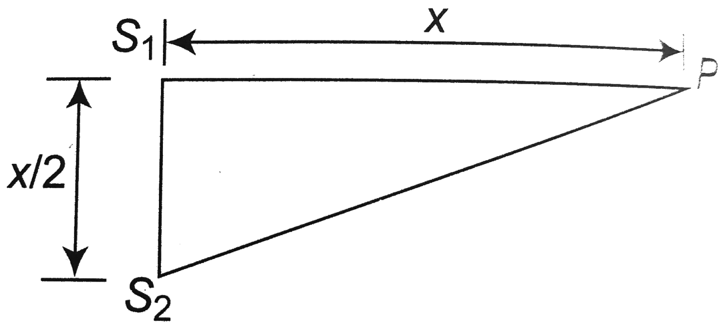
22. 

The wavelength of the waves arriving at P from two coherent sources S_1 and S_2 is 4m, while intensity of each wave is I_0. The resultant intensity at P is $2I_0$. Find the minimum value of S_2P

A. $\frac{x\sqrt{5}}{2}$

B. $2x$

C. $(x+1)$

D. $(x+\sqrt{2})$

Answer: C

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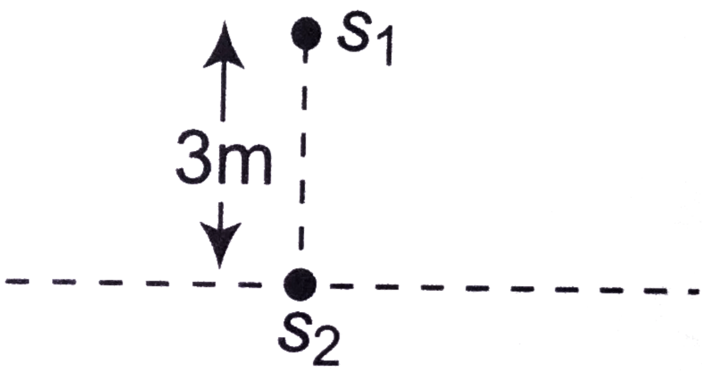
23. 

S_1 and S_2 are two coherent sources of sound having no initial phase difference. The velocity of sound is $330 m / s$. No minima will be formed on the line passing through S_2 and perpendicular to the line joining S_1 and S_2. If the frequency of both the sources is:

A. $50 Hz$

B. $60 Hz$

C. $70 Hz$

D. $80 Hz$

Answer: A

Watch Video Solution

Beats

1. An unknown frequency x produces 8 beats per seconds with a frequency of $250Hz$ and 12 beats with $270Hz$ source. Then x is

A. $258Hz$

B. $242Hz$

C. $262Hz$

D. $282Hz$

Answer: A

Watch Video Solution

2. Two tuning forks when sounded together produced $4beats/\sec$. The frequency of one fork is 256 Hz. The number of beats heard increases when the fork of frequency 256 Hz is loaded with wax. The frequency of the other fork is

A. $504Hz$

B. $520Hz$

C. $260Hz$

D. $252Hz$

Answer: C

Watch Video Solution

3. If two tuning fork A and B are sounded together they produce 4 beats per second. A is then slightly loaded with wax, they produce 2 beats when sounded again. The frequency of A is 256. The frequency of B will be

A. 250

B. 252

C. 260

D. 262

Answer: B

Watch Video Solution

4. The frequencies of two sound sources are 256 Hz and 260 Hz, At $t = 0$ the intesinty of sound is maximum. Then the phase difference at the time $t = 1/16$ sec will be

A. zero

B. π

C. $\pi/2$

D. $\frac{\pi}{4}$

Answer: C

Watch Video Solution

Watch Video Solution

5. When a tuning fork of frequency 341 is sounded with another tuning fork, six beats per second are heard. When the second tuning fork is loaded with wax and sounded with the first fork, the number of beats is two per second. The natural frequency of the second tuning fork is

A. 334

B. 339

C. 343

D. 347

Answer: D

Watch Video Solution

6. Tuning fork F_1 has a frequency of 256 Hz and it is observed to produce $6 beats / \sec ond$ with another tuning fork F_2. When F_2 is loaded with wax, it still produces $6 beats / \sec$

with F_1. The frequency of F_2 before loading was

A. $253 Hz$

B. $262 Hz$

C. $250 Hz$

D. $259 Hz$

Answer: B

Watch Video Solution

7. Beats are produced by two waves given by $y_1 = a \sin 2000\pi t$ and $y_2 = a \sin 2008\pi t$. The number of beats heard per second is

A. zero

B. one

C. four

D. eight

Answer: C

Watch Video Solution

8. A tunig fork whose frequency as given by mufacturer is $512Hz$ is being tested with an accurate oscillator it is found that the fork produces a beat of 2 Hz when oscillator reads 514 Hz but produces a beat of 6 Hz when oscillator reads 510 Hz. The actual frequency of fork is

A. $508Hz$

B. $512Hz$

C. $516Hz$

D. $518Hz$

Answer: C

Watch Video Solution

9. Ten tuning forks are arranged in increasing order of frequency is such a way that any two nearest tuning forks produce $4be * / \sec$. The highest freqeuncy is twice of the lowest. Possible highest and the lowest frequencies are

A. 80 and 40

B. 100 and 50

C. 44 and 22

D. 72 and 36

Answer: D

Watch Video Solution

10. Two identical flutes produce fundamental notes of frequency $300Hz$ at $27^{\circ}C$. If the temperature of air in one flute is increased to

$31^\circ C$, the number of the beats heard per second will be

A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

11. The frequency of tuning forks A and B are respectively 3% more and 2% less than the frequency of tuning fork C. When A and B are simultaneously excited, 5 beats per second are produced. Then the frequency of the tuning fork A (in Hz) Is

A. 98

B. 100

C. 103

D. 105

Answer: C

Watch Video Solution

12. Two tuning forks have frequencies 380 and 384 Hz respectively. When they are sounded together they

produce 4 beats. After hearing the maximum sound how long will it take to hear the minimum sound

A. $1/2 \sec$

B. $1/4\,\text{sec}$

C. $1/8\,\text{sec}$

D. $1/16\text{sec}$

Answer: C

Watch Video Solution

13. When a tuning fork A of unknown frequency is sounded with another tuning fork B of frequency 256Hz, then 3 beats per second are observed. After that A is loaded with wax and sounded, the again 3 beats per second are observed. The frequency of the tuning fork A is

A. $250Hz$

B. $253Hz$

C. $259Hz$

D. $262Hz$

Answer: C

Watch Video Solution

14. A source of sound gives five beats per second when sounded with another source of frequency $100s^{-1}$. The second harmonic of the source together with a source of frequency $205s^{-1}$ gives five beats per second. What is the frequency of the source?

A. $105s^{-1}$

B. $205s^{-1}$

C. $95s^{-1}$

D. $100s^{-1}$

Answer: A

Watch Video Solution

15. Two tunig forks of frequency $250Hz$ and $256Hz$ produce beats. If a maximum is observed just now, after how much time the next maximum is observed at the same place?

A. $1/18\,\text{sec}$

B. $1/24s$

C. $1/6\,\text{sec}$

D. $1/12 \sec$

Answer: C

Watch Video Solution

16. At a point, beats frequency of n Hz is observed it means:

A. medium particles at the point, are vibrating with frequency n Hz.

B. amplitude of vibrations changes simple harmonically with frequency n Hz at that point only

C. at that zero intensity is observed $2n$ times per second.

D. none of these

Answer: D

Watch Video Solution

17. When beats are produced by two progressive waves of nearly the same frequency, which one of the following if correct?

A. the particle vibrate simple harmonically with the frequency equal to the difference in the component frequencies.

B. The amplitude of vibration at any point changes simple harmonically with a frequency equal to the difference in the frequencies of the two waves.

C. The frequency of beats depends upon the position, where the observer is.

D. The frequency of beats changes as the time progresses.

Answer: B

Watch Video Solution

18. When two tuning forks A and B are sounded together x $beats/s$ are heard. Frequency A is n. Now when one prong of B is loaded with a little wax, the number of beats/s decreases. The frequency of fork B is

A. $n+x$

B. $n-x$

C. $n-x^2$

D. $n-2x$

Answer: A

Watch Video Solution

19. Wavelength of two notes in air are 1 m and $1\frac{1}{164}$m. Each note produces 1 beats/s with a third note of a fixed frequency. The speed of sound in air is

A. $330m/s$

B. $340m/s$

C. $350m/s$

D. $328m/s$

Answer: A

Watch Video Solution

20. The wavelength of two sound waves are 49 cm and 50 cm respectively. If the room temperature is $30^{\circ} C$ then the number of beats produced by them is approximately (velocity of sound in air $0^{\circ} C = 332m/s$

A. 6

B. 10

C. 14

D. 18

Answer: C

Watch Video Solution

Stationary Waves

1. In a stationary wave all the particles

A. on either side of a node vibrate in same phase

B. in the region between two nodes vibrate in same phase

C. in the region between two antinodes vibrate in same phase.

D. Of the medium vibrate in same phase.

Answer: B

Watch Video Solution

2. When a stationary wave is formed then its frequency is

A. Same as that of the individual waves

B. Twice that of the individual waves

C. Half that of the individual waves

D. none of the above

Answer: A

Watch Video Solution

3. At a certain instant a stationary transverse wave is found to have maximum kinetic energy. The appearance of string at that instant is

A. Sinusoidal shape with amplitude $A/3$

B. Sinusoidal shape with amplitude $A/2$

C. Sinusoidal shape with amplitude A

D. straight line

Answer: D

Watch Video Solution

4. Which two of the given transverse waves will give stationary waves then get superimposed?

$z_1 = a\cos(kx - \omega t)$.(A)

$z_2 = a\cos(kx - \omega t)$.(B)

$z_3 = a\cos(ky - \omega t)$.(C)

A. A and B

B. A and C

C. B and C

D. any two

Answer: A

Watch Video Solution

5. For the stationary wave $y = 4\sin\left(\frac{\pi x}{15}\right)\cos(96\pi t)$, the distance between a node and the next antinode is

A. 7.5

B. 15

C. 22.5

D. 30

Answer: A

Watch Video Solution

6. A wave representing by the equation $y = a\cos(kx - \omega t)$ is superposed with another wave to form a stationary wave such that point $x = 0$ is a node. The equation for the other wave is

A. $y = a\sin(kx - \omega t)$

B. $y = -a\cos(kx + \omega t)$

C. $y = -a\cos(kx - \omega t)$

D. $y = -a\sin(kx - \omega t)$

Answer: B

Watch Video Solution

7. Two waves are approaching each other with a velocity of $20m/s$ and frequency n. The distance between two consecutive nodes is

A. $\frac{20}{n}$

B. $\frac{10}{n}$

C. $\frac{5}{n}$

D. $\frac{n}{10}$

Answer: B

Watch Video Solution

8. Two sinusoidal waves with same wavelengths and amplitudes travel in opposite directions along a string with a speed $10ms^{-1}$. If the minimum time interval between two instant when the string is flat is $0.5s$, the wavelength of the waves is

A. $25m$

B. $20m$

C. $15m$

D. $10m$

Answer: D

Watch Video Solution

9. Which two of the given transverse waves will give stationary waves then get superimposed?

$z_1 = a\cos(kx - \omega t)$.(A)

$z_2 = a\cos(kx - \omega t)$.(B)

$z_3 = a\cos(ky - \omega t)$.(C)

A. $z_1 + z_2$

B. $z_1 + z_3$

C. $z_3 + z_1$

D. $z_1 + z_2 + z_3$

Answer: A

Watch Video Solution

10. Spacing between two successive nodes in a standing wave on a string is x. If frequency of the standing wave is kept unchanged but tension in the string is doubled, then new sapcing between successive nodes will become:

A. $x / \sqrt{2}$

B. $\sqrt{2}x$

C. $x / 2$

D. $2x$

Answer: B

Watch Video Solution

11. A standing wave pattern is formed on a string One of the waves if given by equation $y_1 = a\cos\left(\omega t - kx + \frac{\pi}{3}\right)$ then the equation of the other wave such that at $x = 0$ a node is formed.

A. $y_2 = a\sin\left(\omega t + kx + \frac{\pi}{3}\right)$

B. $y_2 = a\cos\left(\omega t + kx + \frac{\pi}{3}\right)$

C. $y_2 = a\cos\left(\omega t + kx + \frac{2\pi}{3}\right)$

D. $y_2 = a\cos\left(\omega t + kx + \frac{4\pi}{3}\right)$

Answer: D

Watch Video Solution

12. The equation of a stationary wave is given by

$y = 6\sin\pi / x\cos 40\pi t$ Where y and x are given in cm and time t in second. Then the amplitude of progressive wave is

A. $6cm$

B. $3cm$

C. $12cm$

D. $2cm$

Answer: B

Watch Video Solution

13. In the previous Q. The wavelength of the component progressive wave is

A. $6cm$

B. $3cm$

C. $12cm$

D. $2cm$

Answer: A

Watch Video Solution

14. In The Q. 89 The time period of the component progressive wave is

A. $20 \sec$

B. $40 \sec$

C. $(1/20)\sec$

D. $(1/10)\sec$

Answer: C

Watch Video Solution

15. In the Q.89 the frequency of the component progressive wave is

A. $20Hz$

B. $40Hz$

C. $\left(\frac{1}{2}\right)Hz$

D. $\left(\frac{1}{10}\right)$Hz

Answer: A

Watch Video Solution

16. In the Q.89 the speed of the component progressive wave is:

A. $20cm/\sec$

B. $6cm/\sec$

C. $120cm/\sec$

D. $40cm/\sec$

Answer: C

Watch Video Solution

17. In the Q. 89 The separation between two consecutive antinodes is:

A. $3cm$

B. `6 cm

C. $12cm$

D. $20cm$

Answer: A

Watch Video Solution

18. In the Q. 89 the phase difference between two points on opposite sides of an antinode with a separtion of 1 cm between then is:

A. zero radian

B. $\pi/3$ radian

C. $\pi/2$ radian

D. π radian

Answer: A

Watch Video Solution

19. The paritcle displacement (in cm) in a stationary wave is given by $y(x, t) = 2\sin(0.1\pi x)\cos(100\pi t)$. The distance between a node and the next antinode is

A. $2.5cm$

B. $7.5cm$

C. $5cm$

D. $10cm$

Answer: C

Watch Video Solution

20. Equation of a standing wave is generally expressed as $y = 2A\sin\omega t\cos kx$. In the equation quantity $\frac{\omega}{k}$ represents

A. the transverse speed of the particles of the string

B. the speed of either of the component waves

C. the speed of the standing wave

D. a quantity that is independent of the properties of the string.

Answer: B

Watch Video Solution

Vibration Of String

1. A tuning fork vibrating with a sonometer having 20 cm wire produces 5 beats per second. The beat frequency does not change if the length of the wire is changed to 21 cm. The frequency of the tuning fork (in Hertz) must be

A. 200

B. 210

C. 205

D. 215

Answer: C

Watch Video Solution

2. In order to double the frequency of the fundamental note emitted by a stretched string, the length is reduced to $\frac{3}{4}$th of the original length and the tension is changed. The factor by which the tension is to be changed is

A. $3/8$

B. $2/3$

C. $8/9$

D. $9/4$

Answer: D

Watch Video Solution

3. A string of 7 m length has a mass of 0.035 kg. If tension in the string is 60.5 N. Then speed of a wave on the string is

A. $77m/s$

B. $102m/s$

C. $110m/s$

D. $165m/s$

Answer: C

Watch Video Solution

4. A second harmonic has to be generated in a string of length l stretched between two rigid supports. The point where the string has to be plucked and touched are

A. Plucked at $l/4$ and touch at $l/2$

B. Plucked at $l/4$ and touch at $3l/4$

C. Plucked at $l/2$ and touched at $l/4$

D. Plucked at $l/2$ and touched at $3l/4$

Answer: A

Watch Video Solution

5. Two wires are fixed in a sanometer. Their tension are in the ratio $8:1$ The lengths are in the ratio $36:35$ The diameter are in the ratio $4:1$ Densities of the materials are in the ratio $1:2$ if the lower frequency in the setting is

$360 Hz$. The beat frequency when the two wires are sounded together is

A. 5

B. 8

C. 6

D. 10

Answer: D

Watch Video Solution

6. A string is rigidly tied at two ends and its equation of vibration is given by $y = \sin 2\pi x . \cos 2\pi t$. Then minimum length of string is

A. $1m$

B. $\frac{1}{2}$m

C. $5m$

D. $2\pi m$

Answer: B

Watch Video Solution

Watch Video Solution

7. Fundamental frequency of sonometer wire is n. If the length, tension and diameter of wire are tripled. The new fundamental frequency is

A. $n/\sqrt{3}$

B. $n/2\sqrt{3}$

C. $n\sqrt{3}$

D. $n/3\sqrt{3}$

Answer: D

Watch Video Solution

8. A string of length 2 m is fixed at both ends. If this string vibrates in its fourth normal mode with a frequency of 500 Hz then the waves wouldf travel on it is with a velocity of

A. $125m/s$

B. $25m/s$

C. $500m/s$

D. $1000m/s$

Answer: C

Watch Video Solution

9. Four wires of identical lengths, diameters and materials are stretched on a sonometer box. The ratio of their tension $1:4:9:16$. The ratio of their fundamental frequencies is

A. $16:9:4:1$

B. $4:3:2:1$

C. $1:2:3:4$

D. $1:4:9:16$

Answer: C

Watch Video Solution

10. A guitar string of length L has a fundamental frequency. Where should it be pressed to produced another fundamental frequency. If the two fundamental frequenccis is f?

A. $\frac{L}{f}$

B. fL

C. l / f^2

D. $(L) / \frac{f^1}{2}$

Answer: B

Watch Video Solution

11. The first overtone of a stretched string of given length is 320 Hz. The first harmonic is

A. $320Hz$

B. $640Hz$

C. $160Hz$

D. $480Hz$

Answer: C

Watch Video Solution

12. A wire having a linear mass density $5.0 \times 10^{3} kg/m$ is stretched between two rigid supports with tension of 450 N. The wire resonates at a frequency of $420Hz$. The next higher frequency at which the same wire resonates is $480 N$. The length of the wire is

A. $2.0 m$

B. $2.1 m$

C. $2.5 m$

D. $3 m$

Answer: B

Watch Video Solution

13. A wire of length l having tension T and radius r vibrates with fundamental frequency f. Another wire of the same metal with length $2l$ having tension $2T$ and radius $2r$ will vibrate with fundamental frequency :

A. f

B. $2f$

C. $\frac{f}{2\sqrt{2}}$

D. $\frac{f}{2}\sqrt{2}$

Answer: C

Watch Video Solution

14. The equation for the vibration of a string fixed at both ends vibrating in its third harmonic is given by $y = 2cm \sin\left[\left(0.6cm^{-1}\right)x\right]\cos\left[\left(500\pi s^{-1}\right)t\right]$.

The length of the string is

A. $24.6cm$

B. $12.5cm$

C. $20.6cm$

D. $15.7cm$

Answer: D

Watch Video Solution

15. A violin string oscillating in its fundamental mode, generates a sound wave with wavelength λ. To generate a sound wave with wavelength $\frac{\lambda}{2}$ by the string still oscillating is its fundamental mode, tension must be changed by the multiple.

A. 2

B. $1/2$

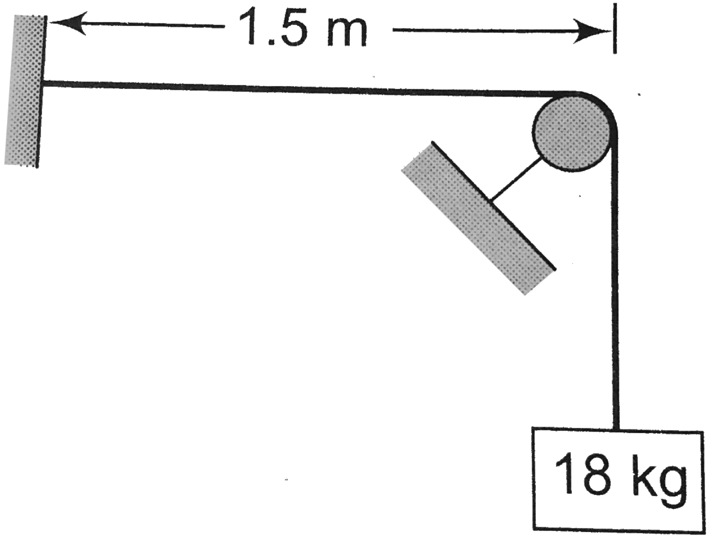
C. 4

D. $1/4$

Answer: C

Watch Video Solution

16.



The length of the wire shown in Fig. Between the pulley and fixed support is $1.5m$ and mass is $12.0g$ the frequency of vibration with which the wire vibrate two loops leaving the middle point of the wire between the pulleys at rest is

A. $10Hz$

B. $30Hz$

C. $100Hz$

D. $70Hz$

Answer: C

Watch Video Solution

17. Two wires are kept tight between the same pair of supports. The tensions in the wires are in the ratio 2 : 1, the radii are in the ratio 3 : 1

and the densities are in the ratio 1 : 2. Find the ratio of their fundamental frequencies.

A. $2 : 3$

B. $2 : 4$

C. $2 : 5$

D. $2 : 6$

Answer: A

Watch Video Solution

18. the fundamental frequency of a sonometer wire of length is f_0.A bridge is now introduced at a distance of $\Delta l$from the centre of the wire $(\Delta l < < l)$. The number of beats heard if their fundamental mode are

A. $\frac{8 f_0 \Delta l}{l}$

B. $\frac{f_0 \Delta l}{l}$

C. $\frac{2 f_0 \Delta l}{l}$

D. $\frac{4 f_0 \Delta l}{l}$

Answer: A

Watch Video Solution

19. A string is fixed at both ends. The tension in the string and density of the string are accurately known but the length and the radius of cross section of the string are known with some errorl If maximum errors made in the measurements of length and radius are 1% and 0.5% respectively them what is the maximum possible percentage error in the calculation of fundamental frequencyof the that string ?

A. 1.5%

B. 2%

C. 2.5%

D. 1%

Answer: A

Watch Video Solution

20. Two vibrating string of same length, same cross section area and stretched to same tension is made of materials with densities ρ

and 2ρ. Each string is fixed at both ends If v_0 represents the fundamental mode of vibration of the one made with density ρ and v_2 for another Then v_1 / v_2 is:

A. $\frac{1}{2}$

B. 2

C. $\sqrt{2}$

D. $\frac{1}{\sqrt{2}}$

Answer: C

Watch Video Solution

21. What is the percentage change in the tension necessary in a somometer of fixed length to produce a note one octave lower (half of original frequency) than before?

A. $25\ \%$

B. $50\ \%$

C. $67\ \%$

D. $75\ \%$

Answer: D

Watch Video Solution

22. A string of length 1.5 m with its two ends clamped is vibrating in fundamental mode. Amplitude at the centre of the string is 4 mm. Minimum distance between the two points having amplitude 2 mm is:

A. $1m$

B. $75cm$

C. $60cm$

D. $50cm$

Answer: A

Watch Video Solution

23. A chord attached about an end to a vibrating fork divides it into 6 loops when its tension is 36 N. The tension at which it will vibrate 4 loops is:

A. $24N$

B. $36N$

C. $64N$

D. $81N$

Answer: D

Watch Video Solution

24. Two parts of sonometer wire, divided by a movable knife edge differ in length by 2 cm and produce 1 beat/s when sounded together. Assume fundamental frequencies. If the total length of the wire is 100 cm. The frequencies. If the total length of the wire is 100 cm. The frequencies of the two parts of the wire are

A. $51Hz.50Hz$

B. $50.5Hz,49.5Hz$

C. $25Hz,24Hz$

D. $25.5Hz,24.5Hz$

Answer: D

Watch Video Solution

Vibration Of Air Column

1. The length of two open organ pipes are l and $(l+\delta l)$ respectively. Neglecting end correction, the frequency of beats between them will be approximately

A. $\frac{v}{2l}$

B. $\frac{v}{4l}$

C. $\frac{v\Delta l}{2l^2}$

D. $\frac{v\Delta l}{l}$

Answer: C

Watch Video Solution

2. Two closed organ pipes, when sounded simultaneously gave 4 beats per sec. If longer pipe has a length of 1 m. Then length of shorter pipe will be $(v = 300m/s)$

A. $185.5cm$

B. $94.9cm$

C. $90cm$

D. $80cm$

Answer: B

Watch Video Solution

3. A closed organ pipe and an open organ pipe are tuned to the same fundamental frequency. The ratio of their lengths is

A. $1:2$

B. $2:1$

C. $2:3$

D. $4:3$

Answer: A

Watch Video Solution

4. On producing the waves of frequency 100 Hz in a kundt's tube the total distance between 6 successive nodes is 85 cm. Speed of sound in the gas filled in the tube is

A. $330m / s$

B. $340m / s$

C. $350m / s$

D. $300m / s$

Answer: B

Watch Video Solution

5. What is the base frequency if a pipe gives notes of frequencies 425, 255 and 595 and decide whether it is closed at one end or open at both ends?

A. $17, closed$

B. 85, $closed$

C. 17, $open$

D. 86, $open$

Answer: B

Watch Video Solution

6. Two closed organ pipes of length 100 cm and 101 cm 16 beats is 20 sec. When each pipe is sounded in its fundamental mode calculate the velocity of sound `

A. $303ms^{-1}$

B. $332ms^{-1}$

C. $323.2ms^{-1}$

D. $300ms^{-1}$

Answer: C

Watch Video Solution

7. In a resonance pipe the first and second resonance are obtained at depths 22.7 cm and

70.2 respectively. What will be the end correction?

A. $1.05cm$

B. $115.5cm$

C. $92.5cm$

D. $113.5cm$

Answer: A

Watch Video Solution

8. A tuning fork of frequency $340 H_Z$ is sounded above an organ pipe of length $120 cm$. Water is now slowly poured in it. The minimum height of water column required for resonance is (speed of sound in air = $340 m / s$)

A. $15 cm$

B. $25 cm$

C. $30 cm$

D. $45 cm$

Answer: D

Watch Video Solution

9. An organ pipe is closed at one end has fundamental frequency of 1500 Hz. The maximum number of overtones generated by this pipe which a normal person can hear is

A. 14

B. 13

C. 6

D. 9

Answer: C

Watch Video Solution

10. The fundamental of a closed pipe is 220 Hz. If $\frac{1}{4}$ of the pipe is filled with water, the frequency of the first overtone of the pipe now is

A. $220Hz$

B. $440Hz$

C. $880Hz$

D. $1760Hz$

Answer: C

Watch Video Solution

11. A glass tube $1.5m$ long and open at both ends, is immersed vertically in a water tank completely. A tuning fork of 660 Hz is vibrated and kept at the upper and of the tube and the tube is gradually raised out of water the total number of resonances heard before the tube comes out of water taking velocity of sound air $330m/s$ is

A. 12

B. 6

C. 8

D. 4

Answer: B

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12. An open organ pipe of length L resonates at fundamental frequency with closed organ pipe. Find the length of closed organ pipe.

A. $2L$

B. $L/2$

C. $L\sqrt{2}$

D. $L\sqrt{3}/2$

Answer: B

Watch Video Solution

13. If the fundamental frequency of a pipe closed at one is $512H_Z$. The frequency of a pipe of the same dimension but open at both ends will be

A. $1024Hz$

B. $512Hz$

C. $256Hz$

D. $128Hz$

Answer: A

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14. An open pipe of length 33 cm resonates to a frequency of 1000 Hz. The mode of vibration is (velocity of sound $= 330 m / s$).

A. Fundamental

B. The 2^{nd} harmonic

C. The 3^{rd} harmonic

D. The 4^{th} harmonic

Answer: B

Watch Video Solution

15. An organ pipe P_1 closed at one vibrating in its first overtone and another pipe P_2. Open at both ends vibrating in third overtone are in resonance with a given tuning fork. The ratio of the length of P_1 to that of P_2 is

A. $8/3$

B. $3/8$

C. $1/2$

D. $\frac{1}{3}$

Answer: B

Watch Video Solution

16. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher by $100Hz$ then the fundamental frequency of the open pipe is

A. $100Hz$

B. $300Hz$

C. $150hz$

D. $200Hz$

Answer: D

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17. In a resonance tube experiment, the first two resonance are observed at length 10.5 cm and 29.5 cm. The third resonance is observed at the length ...(cm)

A. 47.5

B. 58.5

C. 48.5

D. 82.8

Answer: C

Watch Video Solution

18. A closed organ pipe has length L. The air in it is vibrating in third overtone with maximum amplitude a . The amplitude at distance $\frac{L}{7}$ from closed of the pipe is

A. a

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

C. $\frac{\sqrt{3}}{2}a$

D. $\frac{1}{\sqrt{2}}a$

Answer: A

Watch Video Solution

19. An open organ pipe containing air resonates in fundamental mode due to a tuning fork. The measured values of length l (in cm) of the pipe and radius r (in cm) of the pipe are $l = 94 \pm 0.1, r = 5 \pm 0.05$. The velocity of the sound in air is accurately known. The maximum percentage error in the measurement of the frequency of that tuning fork by this experiment will be

A. 0.16

B. 0.64

C. 1.2

D. 1.6

Answer: A

Watch Video Solution

20. An organ pipe of length L is open at one end and closed at other end. The wavelengths of the three lowest resonating frequencies that can be produced by this pipe are

A. $4L, 2L, L$

B. $2L, L, L/2$

C. $2L, L, 2L/3$

D. $4L, 4L/3, 4L/5$

Answer: D

Watch Video Solution

21. The second overtone of an open pipe A and closed pipe B have the same frequencies at a given temperature. Both pipes contain air. The ratio of fundamental frequency of a to the fundamental frequency of B is

A. $3:5$

B. $5:3$

C. $5:6$

D. $6:5$

Answer: B

Watch Video Solution

22. In the above question the ratio of the first overtone of A to first overtone of B is :

A. $5:6$

B. $6:5$

C. $10:9$

D. $9:10$

Answer: C

Watch Video Solution

23. An open organ pipe has a fundamental frequency of $300H_Z$. The first overtone of a closed organ pipe has the same frequency as the first overtone of this open pipe . How long is each pipe ? (Speed of sound in air = $330m / s$)

A. $10cm$

B. $41cm$

C. $82cm$

D. $164cm$

Answer: B

Watch Video Solution

Sound Wave And Loudness

1. The velocity of sound in a gas at temperature $27^{\circ}C$ is v then in the same gas its velocity will be $2v$ at temperature

A. $54^{\circ}C$

B. $327^{\circ}C$

C. $927^{\circ} C$

D. $108^{\circ} C$

Answer: C

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2. Propagation of a sound wave in a gas is quite close to

A. an isothermal process

B. an adiabatic process

C. an isobaric process

D. a process that does not exhibit properties close to any of the three given (a), (b), (c)`

Answer: B

Watch Video Solution

3. A sound wave of frequency 500 Hz covers a distance of 1000 m is 5 sec between the points

X and Y. Then the number of waves between X and Y is

A. 500

B. 1000

C. 2500

D. 5000

Answer: C

Watch Video Solution

4. Under similar conditions of temperature and pressure, in which of the following gases the velocity of sound will be largest?

A. H_2

B. N_2

C. He

D. CO_2

Answer: A

Watch Video Solution

5. A sound wave of frequency 440 Hz is passing through air. An O_2 molecule (mass $= 5.3 \times 10^{-26} Kg$) is set in oscillation with an amplitude of $10^{-6} m$ speed at the centre of its oscillation is :

A. $1.70 \times 10^{-5} m/s$

B. $17.0 \times 10^{-5} m/s$

C. $2.76 \times 10^{-5} m/s$

D. $2.77 \times 10^{-5} m/s$

Answer: C

Watch Video Solution

6. The frequency of a man's voice is 300 Hz and its wavelength is 1 meter. If the wavelength of a child's voice is 1.5 m, then the frequency of the child's voice is"

A. 200 Hz

B. 150 Hz

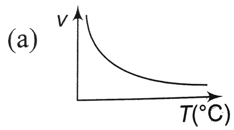
C. 400 Hz

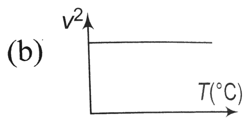
D. $350Hz$

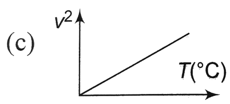
Answer: A

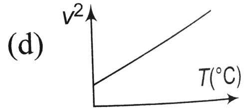
Watch Video Solution

7. The graph between the $(velocity)^2$ and temperature T of a gas is

A. 

B. 

C. 

D. 

Answer: D

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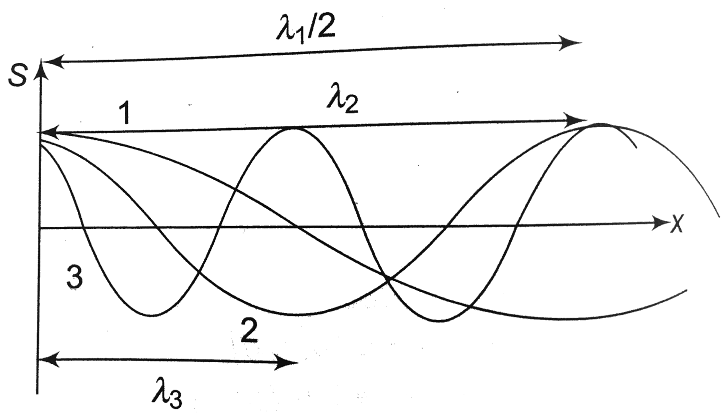
8. 

Figure shown is a graph at a certain time t, of the displacement function $S(x, t)$ of three sound waves $1, 2$ and 3 as marked on the curves that travel along x-axis through air. If P_1,P_2 and P_3 represent their pressure amplitudes respectively then contact relation between them is:

A. $P_1 > P_2 > P_3$

B. $P_3 > P_2 > P_1$

C. $P_1 = P_2 = P_3$

D. $P_2 > P_2 > P_1$

Answer: B

Watch Video Solution

9. The equation of displacement due to a sound wave is $s = \left[s_0 \sin^2(\omega t - kx)\right]$ if the bulk modulus of the medium is B, then the equation of pressure variation due to that sound is

A. $Bks_0 \sin(2\omega t - 2kx)$

B. $-Bks_0 \sin(2\omega t - 2kx)$

C. $Bks_0 \cos^2(\omega t - kx)$

D. $-Bks_0 \cos^2(\omega t - kx)$

Answer: A

Watch Video Solution

10. The average density of Earth's crust 10 km beneath the surface is $2.7gm/cm^3$. The speed of longitudinal seismic waves at that depth is $5.4km/s$ The bulk modulus of Earth's crust considering its behaviour as fluid at that depth is:

A. $7.9 \times 10^{10} Pa$

B. $5.6 \times 10^{10} Pa$

C. $7.9 \times 10^{7} Pa$

D. $1.46 \times 10^{7} Pa$

Answer: A

Watch Video Solution

11. Two identical sound S_1 and S_2 reach at a point P is phase. The resultant loudness at point P is n dB higher than the loudness of S_1 the value of n is :

A. 2

B. 4

C. 5

D. 6

Answer: D

Watch Video Solution

12. In expressing sound intensity we take $10^{-12}\frac{W}{m^2}$ as the reference level. For ordinary conversation the intensity level is about $10^{-6}\frac{W}{m^2}$. Expressed in decibel, this is

A. 10^6

B. 6

C. 60

D. $\log_e(10^6)$

Answer: C

Watch Video Solution

13. A two fold increase in intensity of a wave implies an increase of (Given $\log_{10} 2 = 0.3010.$)

A. $2dB$

B. $10dB$

C. $3.01dB$

D. $0.5dB$

Answer: C

Watch Video Solution

14. A bir is singing on a tree and a man is hearing at a distance r from the bird. Calculate the displacement of the man towards the bird so that the loudness heard by man increases by $20dB$. [Assume that the motion of man is along the joining the bird and the man].

A. $\frac{3r}{4}$

B. $\frac{3r}{10}$

C. $\frac{2r}{3}$

D. $\frac{9r}{10}$

Answer: D

Watch Video Solution

15. For a sound source of intensity IW/m^2, corresponding sound level is B_0 decibel If the intensity is increased to $4I$, new sound level becomes.

A. $2B_0dB$

B. $(B_0+3)dB$

C. $(B_0+6)dB$

D. $4B_0 dB$

Answer: C

Watch Video Solution

16. The sound intensity is $0.008W/m^2$ at a distance of 10 m from an isotropic point source of sound. The power of the source is

A. $2.5W$

B. $0.8W$

C. $8W$

D. $10W$

Answer: D

Watch Video Solution

17. Source waves are emitted uniformly in all directions from a point source. The dependence of sound level β in decibels on the distance r can be expressed as (a and b are positive constants)

A. $\beta = \ - b\log^2$

B. $\beta = a - b\log r^2$

C. $\beta = a - b\log r$

D. $\beta = a - \dfrac{b}{r^2}$

Answer: C

Watch Video Solution

18. A point source is emitting sound in all directions. The ratio of distance of two points from the point source where the difference in loudness levels is 3 dB is: $(\log_{10} 2 = 0.3)$.

A. $\frac{1}{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\frac{1}{4}$

D. $\frac{2}{3}$

Answer: B

Watch Video Solution

19. In a sound wave, to increase the intensity by a factor of 10, pressure amplitude must be changed by a factor of

A. $\sqrt{10}$

B. 10

C. $10\sqrt{2}$

D. $\sqrt{20}$

Answer: A

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20. A person is standing at a distance D from an isotropic point source of sound He walks 50.0 m towards the source and observes that the intensity of the sound has doubled. His initial distance D from the source is

A. $50\sqrt{2}m$

B. $\frac{50\sqrt{2}}{\sqrt{2}-1}m$

C. $\frac{50}{\sqrt{2}-1}m$

D. $100\sqrt{2}m$

Answer: B

Watch Video Solution

21. A person is talking in a small room and the sound intensity level is $60 dB$ everywhere within the room. If there are eight people talking simultaneously in the room, what is the sound intensity level?

A. $60 dB$

B. $69 dB$

C. $74 dB$

D. $81dB$

Answer: B

Watch Video Solution

22. A point source of power 50π watts is producint sound waves of frequency $1875Hz$. The velocity of sound is $330m/s$, atmospheric pressure is $1.0 \times 10^5 Nm^{-2}$ density of air is $1.0kgm^{-3}$. Then pressure amplitude at

$r = \sqrt{330}m$ from the point source is (using $\pi = 22/7$:

A. $5Nm^{-2}$

B. $10Nm^{-2}$

C. $15Nm^{-2}$

D. $20Nm^{-2}$

Answer: A

Watch Video Solution

23. A point source of power 50π watts is producing sound waves of frequency $1875Hz$. The velocity of sound is $330m/s$, atmospheric pressure is $1.0\times10^{5}Nm^{-2}$, density of air is $\frac{400}{99\pi}kgm^{-3}$. Then the displacement amplitude at $r=\sqrt{330}$m from the point source is

A. $0.5\mu m$

B. $0.2\mu m$

C. $1\mu m$

D. $2\mu m$

Answer: C

Watch Video Solution

24. The faintest sound the human ear can detect at a frequency of kHz (for which ear is most sensitive) corresponds to an intensity of about $10^{-12}w/m^2$. Assuming the density of air $\cong 1.5kg/m^3$ and velocity of sound in air $\cong 300m/s$, the pressure amplitude and displacement amplitude of the sound will be rspectively ____N/m^2 and ____m.

A. $3 \times 10^{-5} Pa, \dfrac{1}{3\pi} \times 10^{-10} m$

B. $2 \times 10^{-5} Pa, \dfrac{2}{3\pi} \times 10^{-10} m$

C. $5 \times 10^{-5} Pa, \dfrac{1}{\pi} \times 10^{-10} m$

D. $5 \times 10^{-5} Pa, \dfrac{4}{3\pi} \times 10^{-10} m$

Answer: A

Watch Video Solution

25. A straight line source of sound of length $L = 10m$, emits a pulse of sound energy (in mW) is intercepted by an acoustic cylindrical detector of surface area $2.4cm^2$. Located at a perpendicular distance 7 m from the source ? The waves reach perpenducular at the surface of the detector. The total emiited by the source in the form of sound is $2.2 \times 10^4 W$. (use $\pi = 22/7$)

A. 12

B. 9

C. 25

D. 16

Answer: A

Watch Video Solution

26. When a sound wave is reflected from a wall the phase difference between the reflected and incident pressure wave is:

A. 0

B. π

C. $\pi / 2$

D. $\pi / 4$

Answer: A

Watch Video Solution

27. If amplitude of a wave is represented by $A = \frac{c}{a+b-c}$. Then the resonance will occur when.

A. $b = -c/2$

B. $b = 0$ and $a = c$

C. $b = \frac{-a}{2}$

D. none

Answer: B

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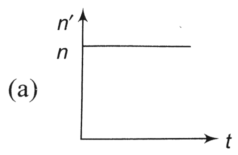
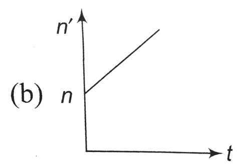
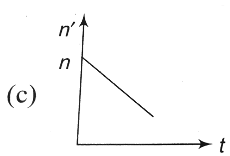
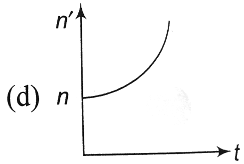
Doppler Effect

1. An observer starts moving with uniform acceleration a towards a stationary sound source emitting a whistle of frequency n. As the observer approaches source, the apparent frequency, head by the observer varies with time as

A. 

B. 

C. 

D. 

Answer: B

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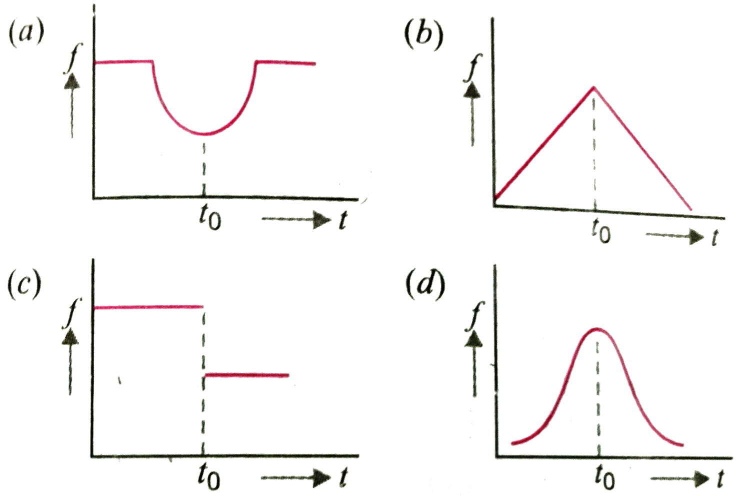
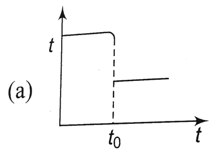
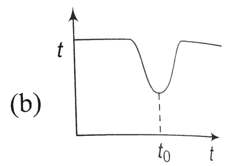
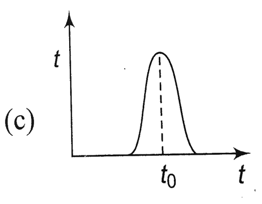
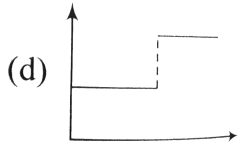
2. A man is standing on a railway platform listening to the whistle of an engine, that passes the man at constant speed without stopping. If the engine passes the man at time t_0, how does the frequency f of the whistle as head by the man changes with time ?



A. 

B. 

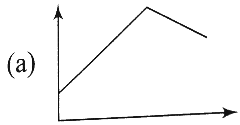
C. 

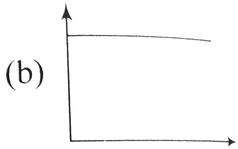
D. 

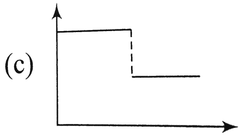
Answer: A

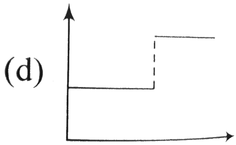
Watch Video Solution

3. An observer approaches towards a stationary source of sound at constant velocity and recedes away at the same speed. The graph of wavelength observed with time is:

A. 

B. 

C. 

D. 

Answer: B

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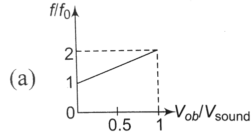
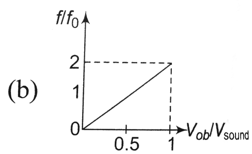
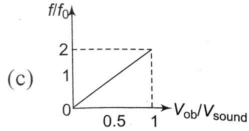
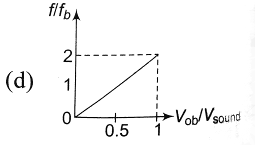
4. A curve is plotted to represenet the dependence of the ratio of the received frequency f to the frequency f_0 emitted by the source on the ratio of the speed of obsever V_{ob} to the speed of sound V_{sound} in a situation in which an observer is moving towards a stationary sound source. The curve is best represnted by :

A. 

B. 

C. 

D. 

Answer: A

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5. Two passenger trains moving with a speed of $108 km / hour$ cross each other. One of them blows a whistle whose frequency is $750 Hz$. If sound speed is $330 m / s$, then passengers sitting in the other train, after trains cross each other they will hear sound whose frequency will be

A. $900 Hz$

B. $625 Hz$

C. $750 Hz$

D. $800 Hz$

Answer: B

Watch Video Solution

6. With what velocity an observer should move relative to a stationary source so that he hears a sound of double the frequency of source?

A. Velocity of sound towards the source

B. Velocity of sound away from the source

C. Half the velocity of sound towards the source.

D. Double the velocity of sound towards the source.

Answer: A

Watch Video Solution

7. A source sound is moving with constant velocity of $20 m/s$ emitting a note of frequency $1000 Hz$. The ratio of frequencies observed by a stationary observer while the source approaching him and after it crosses him will be source is approaching him and after it crosses him will be

A. $9:8$

B. $8:9$

C. $1:1$

D. $9:10$

Answer: A

Watch Video Solution

8. A table is revolving on its axis at 5 revolutions per second. A sound source of frequency $1000Hz$ is fixed on the table at $70cm$ from the axis. The minimum frequency heard by a listener standing at a distance from the table will be (speed of sound $= 352 m / s$).

A. $1000 Hz$

B. $1066 Hz$

C. $941 Hz$

D. $352 Hz$

Answer: C

Watch Video Solution

9. A source of sound S of frequency 500 Hz situated between a stationary observer O and wall W, moves towards the wall with a speed of $2m/s$. If the velocity of sound is $332m/s$. Then the number of beats per second heard by the observer is (approximately)

A. 8

B. 6

C. 4

D. 2

Answer: B

Watch Video Solution

10. A motor car blowing a horn of frequency $124 vib / \sec$ moves with a velocity $72 km / hr$ towards a tall wall. The frequency of the reflectedf sound heard by the driver will be (velocity of sound in air is $330 m / s$)

A. $109 vib / \sec$

B. $132 vib / \sec$

C. $140 vib / \sec$

D. $248 vib / \sec$

Answer: C

Watch Video Solution

11. An observer standing at station observes frequency $219 Hz$ when a train approaches and $184 Hz$ when train goes away from him. If velocity of sound in air is $340 m / s$, then velocity of train and actual frequency of whistle will be

A. $15.5ms_{1}, 200Hz$

B. $19.5ms^{-1}, 205Hz$

C. $29.5ms^{-1}, 200Hz$

D. $32.5ms^{-1}, 200Hz$

Answer: C

Watch Video Solution

12. Two sirens situated one kilometer apart are producing sound of frequency 330 Hz. An observer starts moving from one siren to the other with a speed of $2m/s$. If the speed of sound be $330m/s$, what will be the beat frequency heard by the observer?

A. 8

B. 4

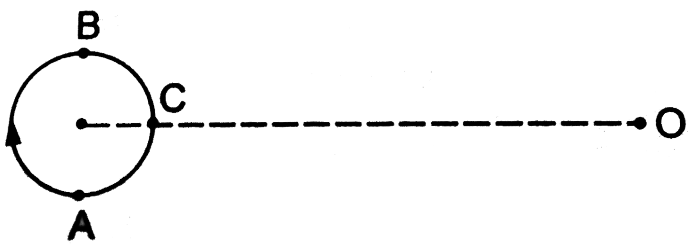
C. 6

D. 1

Answer: B

Watch Video Solution

13. A small source of sound moves on a circle as shown in figure and an observer is sitting at O. Let v_1, v_2, v_3 be the frequencies heard when the source is at A,B and C respectively.



A. $n_1 > n_2 > n_3$

B. $n_2 > n_3 > n_1$

C. $n_1 = n_2 = n_3$

D. $n_2 > n_1 > n_3$

Answer: B

Watch Video Solution

14. A source of sound of frequency $256Hz$ is moving rapidly towards wall with a velocity of $5m/\sec$. How many beats per second will be heard if sound travels at a speed of $330m/\sec$.

A. $7.8Hz$

B. $6.7Hz$

C. $3.9Hz$

D. zero

Answer: A

Watch Video Solution

15. The apparent frequency of a note is 200 Hz when a listener is moving with a velocity of 40 ms^{-1} towards a stationary source. When he moves away from the same source with the same speed, the apparent frequency of the same note is 160 Hz. The velocity of sound in air (in m/s) is :-

A. 360

B. 330

C. 320

D. 340

Answer: A

Watch Video Solution

16. The difference between the apparent frequency of a sound of soun as perceived by an observer during its approach and recession is 2% of the natural frequency of the source. If the velocity of sound in air is $300m/s$, the velocity of the source is (It is given that velocity of source `ltlt velocity of sound)

A. $6sm/\sec$

B. $3m/\sec$

C. $1.5m/\sec$

D. $12m / \sec$

Answer: B

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17. Two cars are moving on two perpendicular road towards a crossing with uniform speeds of $72km / h$ and $3km / h$. If first car blows horn of frequency 280 Hz, then the frequency of horn heard by the driver of second car when line joining the cars make 45° angle with the roads, will be

A. $321 Hz$

B. $298 Hz$

C. $289 Hz$

D. $280 Hz$

Answer: B

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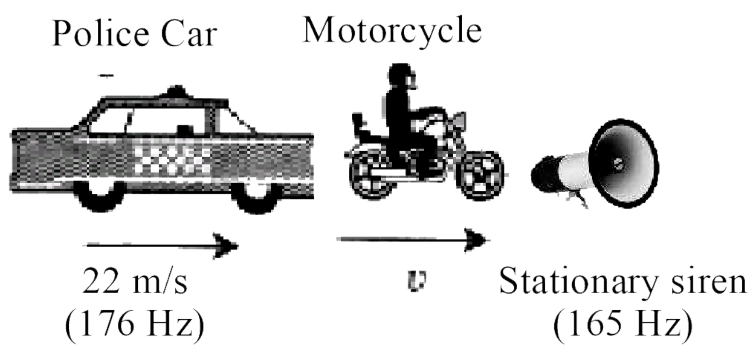
18. A police car moving at 22 m/s, chases a motorcylist. The police man sounds his horn at 176 Hz, while both of them move towards a stationary siren of frequency 165 Hz. Calculate the speed of the motorcycle, if it is given that he does not observes any beats



A. $33m/s$

B. $22m/s$

C. zero

D. $11m/s$

Answer: B

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19. A stationary observer receives sonic oscillations from two tuning forks one of which approaches and the other recedes with the same velocity. As this takes place, the observer hears the beats of frequency

$f = 2.0 H_Z$. Find the velocity of each tuning fork if their oscillation frequency is $f_o = 680 H_Z$ and the velocity of sound in air is $v = 340 m / s$.

A. $1 m / s$

B. $2 m / s$

C. $0.5 m / s$

D. $1.5 m / s$

Answer: C

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20. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

A. 5

B. 20

C. zero

D. 10

Answer: B

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21. At each of two stations A and B, a siren is sounding with a constant frequency of 250 cycle s^{-1}. A cyclist from A proceeds straight towards B with a velocity of $12kmh^{-1}$ and hear $5beats/s$. The velocity of sound is nearly:

A. $328ms^{-1}$

B. $320ms^{-1}$

C. $333ms^{-1}$

D. $336ms^{-1}$

Answer: C

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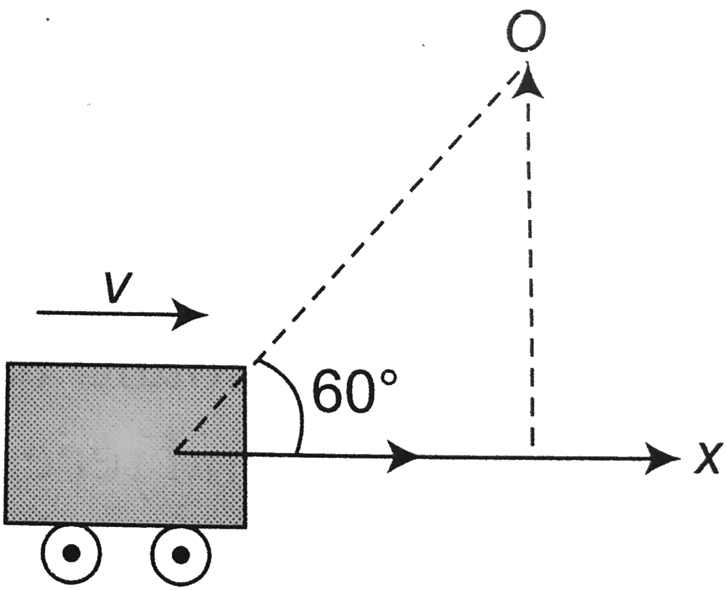

22.

A car is moving along X-axis with a velocity $v = 20m/s$. It sounds a whistle of frequency

660 Hz. If the speed of sound is $340m/s$. The apparent frequency heard by the observer O (shown in figure) is:

A. $680Hz$

B. $640Hz$

C. $700Hz$

D. $720Hz$

Answer: A

Watch Video Solution

23. A train is passing by a platform at a constant speed of $40 m / s$. The train horn is sounded at a frequency of $378 Hz$. Find the overall change in frequency as detected by a person standing on the platform, as the train moves from approaching to receding. (Take velocity of sound in air as $320 m / s$).

A. $104 Hz$

B. $92 Hz$

C. $84 Hz$

D. $96 Hz$

Answer: D

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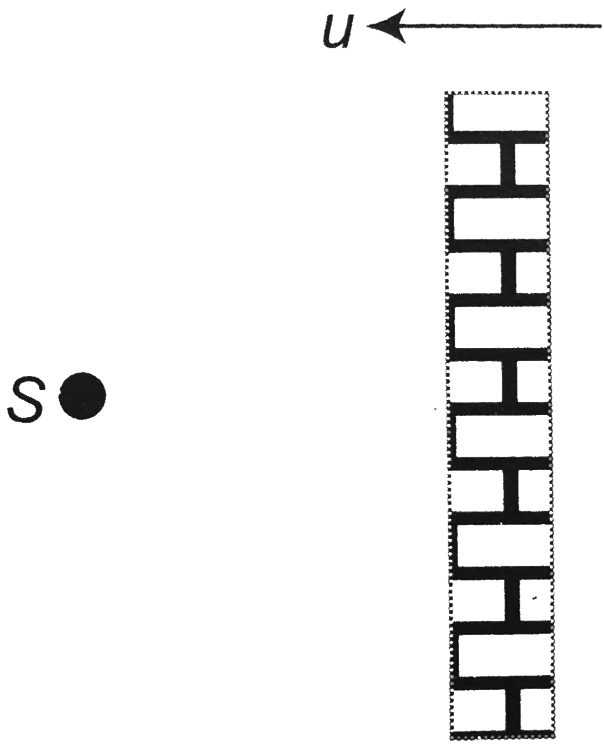

24.

A wall is moving with constant velocity u

towards a fixed source of sound of frequency f. The velocity of sound is v. The wavelength of the sound reflected by the wall is

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

B. $\frac{v-u}{f}$

C. $\frac{v+u}{f}$

D. $\frac{v-u}{v+u}\cdot\frac{v}{f}$

Answer: D

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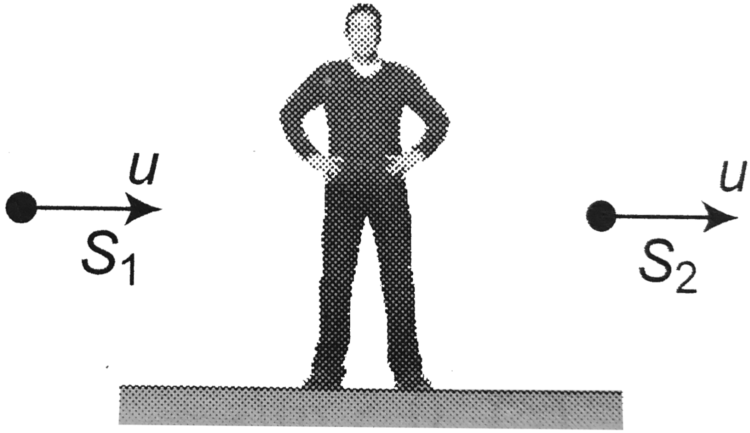

25.

Two sources S_1 and S_2 of same frequency f emits sound. The sources are moving as shown with speed u each. A stationary observer hears that sound. The beat frequency is ($v =$ velocity sound)

A. $\dfrac{2u^2 f}{v^2 - u^2}$

B. $\dfrac{2v^2 f}{v^2 - u^2}$

C. $\frac{2uvf}{v^2 - u^2}$

D. $\frac{2u}{v}f$

Answer: C

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Problems Based On Mixed Concepts

1. Two identical wires are stretched by the same tension of $101N$ and each emits a note of frequency $202Hz$. If the tension in one wire is increased by $1N$, then the beat frequency is

A. $2Hz$

B. $\frac{1}{2}Hz$

C. $1Hz$

D. none of these

Answer: C

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2. A string of length L fixed at its at its both ends is vibrating in its 1^{st} overtone mode. Consider two elements of the string of same small length at position $l_1 = 0.2L$ and $l_2 = 0.45L$ from one end. If K_1 and K_2 are their respective maximum kinetic energies then

A. $K_1 = K_2$

B. $K_1 > K_2$

C. $K_1 < K_2$

D. it is not possible to decide the relation

Answer: B

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3. How long will it take sound waves to travel a distance l between points A and B if the air temperature between them varies linearly from T_1 and T_2? (The velocity of sound in air at temperature T is given by $v = \alpha\sqrt{T}$, where α is a constant)

A. $\dfrac{2l}{\alpha\sqrt{T_1T_2}}$

B. $\alpha l\sqrt{\dfrac{T_1}{T_2}}$

C. $\sqrt{T_1+T_2}.\ \alpha l$

D. $\dfrac{2l}{\alpha\left(\sqrt{T_2}+\sqrt{T_1}\right)}$

Answer: D

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4. A steel wire of length $1m$, mass $0.1kg$ and uniform cross-sectional area $10^{-6}m^2$ is rigidly fixed at both ends. The temperature of the wire is lowered by $20^\circ C$. If transverse waves are set up by plucking the string in the middle.Calculate the frequency of the fundamental mode of vibration.

Given for steel $Y = 2 \times 10^{11} N/m^2$

$\alpha = 1.21 \times 10^{-5} per^\circ C$

A. 18 Hz

B. 22 Hz

C. 32 Hz

D. 42 Hz

Answer: B

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5. Velocity fo wave in a wire fixed at both ends is $70m/s$, Length of the wire can be varied from 2.5 m to $3.5m$. In how many ways the resonance can be obtained using one tuning fork at a time out of five tuning forks of frequencies $12, 19, 29, 42, 55Hz$

A. 5 ways

B. 7 ways

C. 4 ways

D. 9 ways

Answer: A

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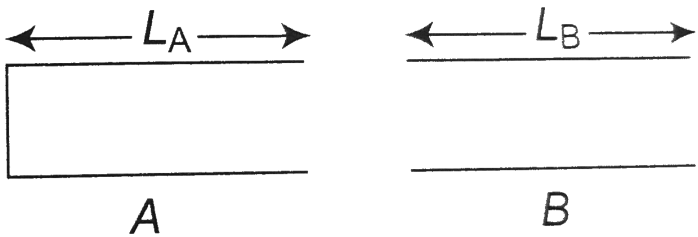
6. 

The two pipes are submerged in sea water, arranged as shown in figure. Pipe A with length $L_A = 1.5m$ and one open end, contains a small sound source that sets up the standing wave with the second lowest resonant frequency of that pipe. Sound from pipe A sets up resonance in pipe B, which has both ends open. The resonance is at the second lowest resonant frequency of pipe B. The length of the pipe B is

A. 1m

B. 1.5 m

C. 2 m

D. 3 m

Answer: C

Watch Video Solution

7. Two tuning fork when sounded together, produce 3 $beats/s$. One of the fork is in unison with $27cm$ length of sonometer wire and other with $28cm$ length of the same wire. The frequencies of the two tuning forks are

A. 87:84 Hz

B. 42:39 Hz

C. 81:78 Hz

D. 84:81 Hz

Answer: D

Watch Video Solution

8. The equation of a longitudinal wave is given by $y = 10 \sin 2\pi \left(50t + \frac{50}{22}x \right)$ (in S.I units). Find the value of x at which change in pressure is maximum at $t = 0$.

A. 0.17 m

B. 0.36 m

C. 0.66 m

D. 0.89 m

Answer: C

Watch Video Solution

9. The string fixed at both ends has standing wave nodes for which distance between adjacent nodes is x_1. The same string has another standing wave nodes for which distance between adjacent nodes is x_2. If l is the length of the string then $x_2 / x_1 = l(l + 2x_1)$. What is the difference in numbers of the loops in the two cases?

A. 1

B. 2

C. 3

D. 4

Answer: B

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10. A wire is stretched between two rigid supports. It is observed that wire resonates at the frequencies f_1, f_2, f_3 and $f_4 (f_4 > f_3, f_2 > f_1)$ forming 2,3,4 and 5 loops respectively. The ratio of any two resonance frequencies will be minimum for difference in the loops to be:

A. 1

B. 2

C. 3

D. zero

Answer: C

Watch Video Solution

11. The equation of a travelling and stationary waves are $y_1 = a\sin(\omega t - kx)$ and $y_2 = a \sin kx \cos \omega t$. The phase difference between two points $x_1 = \frac{\pi}{4k}$ and $\frac{4\pi}{3k}$ are ϕ_1

and ϕ_2 respectively for two waves, where k is the wave number. The ratio ϕ_1 / ϕ_2

A. $6 / 7$

B. $16 / 3$

C. $12 / 13$

D. $13 / 12$

Answer: C

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12. The pipe closed at one end, has an air column. The air column is in resonance with a vibrating tuning fork of frequency $f(75Hz < f < 300Hz)$. Length of air column is $93.75cm$ find f (speed of sound in air is $330\frac{m}{s}$)

A. $78Hz$

B. $197Hz$

C. $264Hz$

D. $284Hz$

Answer: C

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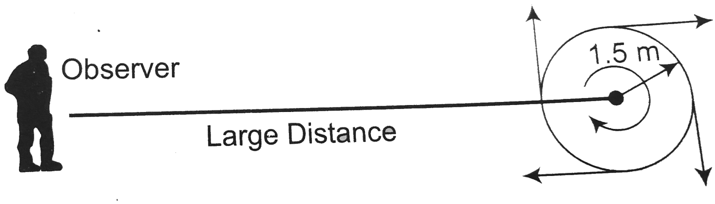
13. 

A whistle emitting a sound of frequency $440H$ z is tied to string of $1.5m$ length and rotated with an angular velocity of $20rad/\sec$ in the horizontal plane. Then the range of frequencies heard by an observer stationed at a large distance from the whistle will

$(v = 330m/s)$

A. $400.0Hz$ to $484.0Hz$

B. $403.3Hz$ to $480.0Hz$

C. $400.0Hz$ to $480.0Hz$

D. 403.3 Hz to $484.0Hz$

Answer: D

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14. A train has just completed a U-curve in a track which is a semi circle. The engine is at the forward end of the semi circular part of the track while the last carriage is at the rear end of the semi circular track. The driver blows a whistle of frequency 200 Hz. Velocity of sound is $340\frac{m}{s}$. Then the apparent frequency as observed by a passenger in the middle of the train, when the speed of the train is 30 m/s, is

A. $209Hz$

B. $288Hz$

C. $200Hz$

D. $181Hz$

Answer: C

Watch Video Solution

15. A sounding body emitting a frequency of $150H_Z$ is dropped from a height. During its fall under gravity it crosses a balloon moving upwards with a constant velocity of $2m/s$ one second after it started to fall . The difference in the frequency observer by the man in balloon just before and just afer crossing the body will be (velocity of sound $= 300 m / s$, $g = 10 m / s^2$)

A. 12

B. 6

C. 8

D. 4

Answer: A

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AIIMS Questions

1. Assertion : Compression and rarefaction involve changes in density and pressure.

Reason : When particles are compressed, density of medium increases and when they are rarefied, density of medium decreases.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

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2. Assertion : Sound would travel faster on a not summer day than on a cold winter day,

Reason : Velocity of sound is directly proportional to the square of its absolute temperature.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

3. Assertion : The basic of Laplace correction was that, exchange of heat between the region of compression and rarefaction in air is not possible.

Reason : Air is a bad conductor of heat and velocity of sound in air is large.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: C

Watch Video Solution

4. Assertion : When we start filling an empty bucket with water, the pitch of sound produced goes on decreasing.

Reason : The frequency of man voice is usually higher than of woman.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

Watch Video Solution

5. Assertion : Solids can support both longitudinal and transverse waves but only longitudinal waves can propagate in gases.

Reason : For the propagation of transverse waves, medium must also necessarily have the property of rigidity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

6. Assertion : Under given conditions of pressure and temperature, sound travels faster in a monoatomic gas than in diatomic gas.

Reason : Opposition for wave to travel is more in a monoatomic gas than in diatomic gas.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: C

Watch Video Solution

7. Assertion : The speed of soun in solids is maximum though density is large.

Reason : The coefficient of elasticity of solid is large.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

8. Assertion : On a rainy day sound travel slower than on a dry day.

Reason : When moisture is present in air the density of air increases.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

Watch Video Solution

9. Assertion : To hear distinct beats, difference in frequencies of two sources should be less than 10.

Reason : More the number of beats per sec more difficult it is to hear them.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: B

Watch Video Solution

10. Assertion : Sound produced by an open organ pipe is richer than the sound produced by pipe from both ends, in case of oper organ pipe.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: B

Watch Video Solution

11. Assertion : It is not possible to have interference between the waves produced by two violins.

Reason : For interference of two waves the phase difference between the wave must remain constant.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

12. Assertion : Beats can also be observed by two light sourcesas in sound.

Reason : Light sources have constant phase deference.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

Watch Video Solution

13. Assertion : In the case of a stationary wave, a person hear a loud sound at the nodes as compared to the particles of the medium vibrate in phases.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: C

Watch Video Solution

14. Assertion : Velocity of particles, while crossing mean position (in stationary waves) varies from maximum at antinodes to zero at nodes.

A. If both assertion and reason are true and reason is the correct expleanation of assertion.

B. If both assertion and reason are true and reason is not the correct expleanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

15. Assertion : Where two vibrating tuning forks having frequencies $256 Hz$ and $512 Hz$ are held near each other, beats cannot be heard.

Reason : The principle of superposition is valid only if the frequencies of the oscillators are nearly equal.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: C

Watch Video Solution

16. Assertion : The fundamental frequency of an open organ pipe increases as the temperature increases, the velocity of sound increases more rapidly than length of the pipe.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

17. A is singing a note and at the same time B is singing a note with exactly one eighth the frequency of the note of A. The energies of two sounds are equal, the amplitude of the note of B is

A. same that of A

B. twice as that of A

C. four times as that of A

D. eight times as that of A

Answer: D

Watch Video Solution

18. The tension in a piano wire is $10N$. The tension ina piano wire to produce a node of double frequency is

A. $20N$

B. $120N$

C. $10N$

D. $40N$

Answer: D

Watch Video Solution

19. In a sinusoidal wave the time required for a particular point to move from equilibrium position to maximum displacement is $0.17s$, then the frequency of wave is:

A. $1.47Hz$

B. $0.36Hz$

C. $0.73Hz$

D. $2.93Hz$

Answer: A

Watch Video Solution

20. Two sound waves have phase difference of 60°, then they will have the path difference of:

A. 2λ

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

C. $\frac{\lambda}{6}$

D. $\frac{\lambda}{3}$

Answer: C

Watch Video Solution

21. A siren emitting sound of frequency $800Hz$ is going away from a static listener with a speed of $30m/s$. frequency of sound to be heard by the listener is: $(\text{velocity of sound} = 330m/s)$

A. 481.2 Hz

B. 286.5 Hz

C. 733.3 Hz

D. 644.8 Hz

Answer: C

Watch Video Solution

22. The velocities of sound at same temperature in two monoatomic gases densities ρ_1 and ρ_2 are v_1 and v_2 respectively , if $\frac{\rho_1}{\rho_2} = 4$, then the value of $\frac{v_1}{v_2}$ will be

A. $4:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: C

Watch Video Solution

23. The equation of a sound wave is $y = 0.0015 \sin(62.4x + 316t)$ the wavelength of this wave is

A. $0.2 unit$

B. $0.1 unit$

C. $0.3 unit$

D. cannot the calcualted

Answer: B

Watch Video Solution

24. A wave representing by the equation $y = a\cos(kx - \omega t)$ is suerposed with another wave to form a stationary wave such that point $x = 0$ is a node. The equation for the other wave is

A. $y = a\sin(kx - \omega t)$

B. $y = -a\cos(kx + \omega t)$

C. $y = -a\cos(kx - \omega t)$

D. $y = -a\sin(kx - \omega t)$

Answer: B

Watch Video Solution

25. A string in a musical instrument is $50cm$ long and its fundamental frequency is $800Hz$. If the frequency of $1000Hz$ is to be produced then required length of spring is

A. $62.5cm$

B. $50cm$

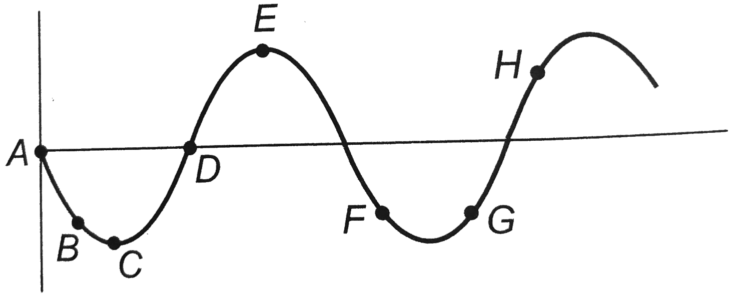
C. $40cm$

D. $37.5cm$

Answer: C

Watch Video Solution

26. The diagram below shows the propagation of a wave. Which points are in same phase?



A. F and G

B. C and E

C. B and G

D. B and F

Answer: D

Watch Video Solution

27. Water waves are

A. longitudinal

B. transverse

C. both londitudinal and transverse

D. neither longitudinal nor transverse

Answer: C

Watch Video Solution

28. An organ pipe is closed at one end has fundamental frequency of 1500 Hz. The maximum number of overtones generated by this pipe which a normal person can hear is

A. 14

B. 13

C. 6

D. 9

Answer: C

Watch Video Solution

Watch Video Solution

29. In the $5th$ overtone of an open organ pipe, these are (N-stands for nodes and A- for antinodes)

A. $2N, 3A$

B. $3N, 4A$

C. $4N, 5A$

D. $5N, 4A$

Answer: C

Watch Video Solution

30. Two waves are propagating to the point P along a straight line produced by two sources A and B of simple harmonic and of equal frequency. The amplitude of every wave at P is a and the phase of A is ahead by $\pi/3$ than that of B and the distance AP is greater than BP by $50cm$. Then the resultant amplitude at the point P will be if the wavelength 1 meter

A. $2a$

B. $a\sqrt{3}$

C. $a\sqrt{2}$

D. a

Answer: D

Watch Video Solution

31. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher by $100Hz$ then the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is

A. $480Hz$

B. $300Hz$

C. $240Hz$

D. $200Hz$

Answer: D

Watch Video Solution

32. A person speaking normally produces a sound intensity of $40dB$ at a distance of $1m$. If the threshold intensity for reasonable audibility is $20dB$, the maximum distance at which he can be heard cleary is.

A. $10m$

B. $5m$

C. $4m$

D. $20m$

Answer: A

Watch Video Solution

33. A closed organ pipe of length 1.2 m vibrates in its first overtone mode. The pressure variation is maximum at

A. $0.4m$ from the open end

B. $0.4m$ from the closed end

C. Both (a) and (b)

D. $0.8m$ from the open end

Answer: A

Watch Video Solution

34. The ratio of intensities between two coherent sound sources is $4:1$ the difference of loudness in decibels between maximum and minimum intensities, when they interfere in space, is

A. $10 \log 2$

B. $20 \log 3$

C. $10 \log 3$

D. $20 \log 2$

Answer: B

Watch Video Solution

35. A fork A has frequency 2% more than the standard fork and B has a frequency 3% less than the frequency of same standard frok. The forks A and B when sounded together produced 6 beats/s. The frequency of fork A is

A. $116.4 Hz$

B. $120Hz$

C. $122.4Hz$

D. $238.8Hz$

Answer: C

Watch Video Solution

36. A source of sound S is moving with a velocity of $50m/s$ towards a stationary observer. The observer measures the frequency of the source as 1000 Hz. What will be the apparent frequency of the source as 1000 Hz. What will be the apparent frequency of the source when it is moving away from the observer after crossing him? The velocity of the sound in the medium is $350m/s$

A. $750Hz$

B. $857Hz$

C. $1143Hz$

D. $1333Hz$

Answer: A

Watch Video Solution

37. The fundamental of a closed pipe is 220 Hz. If $\frac{1}{4}$ of the pipe is filled with water, the frequency of the first overtone of the pipe now is

A. $220Hz$

B. $440Hz$

C. $880Hz$

D. $1760Hz$

Answer: C

Watch Video Solution

38. A transverse sinusoidal wave of amplitude a, wavelength λ and frequency f is travelling on a stretched string. The maximum speed of any point in the string is $v/10$, where v is the speed of propagation of the wave. If $a = 10^{-3}m$ and $v = 10ms^{-1}$, then λ and f are given by

A. $y = 2\pi \times 10^{-2} m$

B. $\lambda = 10^{-3} m$

C. $n = \frac{10^3}{2\pi} Hz$

D. $n = 10^4 Hz$

Answer: A::C

Watch Video Solution

39. Three similar wires of frequency n_1, n_2 and n_3 are joined to make one wire. Its frequency will be

A. $n = n_1 + n_2 + n_3$

B. $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

C. $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$

D. $\frac{1}{n_2} = \frac{1}{n_1^2} + \frac{1}{n_2^2} + \frac{1}{n_3^2}$

Answer: B

Watch Video Solution

40. The velocity of sound waves in air is $330m/s$. For a particluar sound in air, a path difference of $40cm$ is equivalent to a phase difference of 1.6π. The frequency of this wave is

A. $165hz$

B. $150Hz$

C. $660Hz$

D. $330Hz$

Answer: C

Watch Video Solution

41. A person carrying a whistle emitting continuously a note of $272 Hz$ is runnig towards a reflecting surface with a speed of $18 km / h$. The speed of sound in air is $345 m s^{-1}$ The number of beats heard by him is

A. 4

B. 6

C. 8

D. 3

Answer: C

Watch Video Solution

42. A wave packet with angular frequency ω_0 is propagating in dispersive medium with phase velocity of $1.5 \times 10^3 m / s$. When the frequency is increased by 2%, the phase velocity is found to decrease by 3% what is the group velocity of the wave packet?

A. $0.75 \times 10^3 m / s$

B. $1.0 \times 10^3 \frac{m}{s}$

C. $0.25 \times 10^3 m / s$

D. $0.6 \times 10^3 m / s$

Answer: D

Watch Video Solution

43. When a stretched wire and a tuning fork are sounded together, 5 beats per second are produced, when length of wire is $95cm$ or $100cm$, frequency of the fork is

A. $90Hz$

B. $195Hz$

C. $100Hz$

D. $105hz$

Answer: B

Watch Video Solution

44. Assertion: soldiers are asked to break steps while crossing the bridge.

Reason: The frequency of marching may be equal to the natural frequency of bridge and may lead to resonance which can break the bridge.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

45. Assertion: Speed of wave $\frac{wavelen > h}{timeperiod}$

Reason: Wavelength is the distance between two nearest particles in phase.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

46. Assertion: The flash of lightening is sees before the sound of thunder is heard.

Reason: Speed of sound is greater than speed of light.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: C

Watch Video Solution

47. Asserion: When a beetle moves along the sand within a few tens of centimeters of a sand scorpion, the scorpion immedeately turn towards the beetle and dashes to it.

Reason: When a beetle disturbs the sand, it sends pulses along the sand surface one set of pulses in londitudinal while other set is transvers.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

48. Assertion: Sound travels faster in solids than gases.

Reason: Solid possesses greater density than gases.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

49. Assertion: The change in air pressure effects the speed of sound.

Reason: The speed of sound in gases is proportional to the square of pressure.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

50. Assertion: The fundamental frequency of an open organ pipe increases as the temperature is increased.

Reason: As the temperature increases, the velocity of sound increases more rapidly than length of the pipe.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

51. Assertion: In a stationary wave, there is no transfer of energy.

Reason: There is no outward motion of the distubance from one particle to adjoing particle in a stationary wave.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

52. Assertion : It is not possible to have interference between the waves produced by two violins.

Reason : For interference of two waves the phase difference between the wave must remain constant.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

53. Assertion: Transverse waves are not produced in liquids and gases.

Reason: Light waves are transverse waves.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

54. Assertion: Water waves in a river are not polarized.

Reason: Water waves are longitudinal in nature.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

Watch Video Solution

55. Assertion: In a string wave, during reflection from fix boundary, the reflected wave is inverted.

Reason: The force on string by clamp is in downward direction while string is pulling the clamp is upward direction.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: A

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NEET Questions

1. The equation of a wave is represented by $y = 10^{-4} \sin\left[100t - \frac{x}{10}\right]$. The velocity of the wave will be

A. $100 m / s$

B. $250 m / s$

C. $750 m / s$

D. $1000 m / s$

Answer: D

Watch Video Solution

2. A string of 7 m length has a mass of 0.035 kg. If tension in the string is 60.5 N, then speed of a wave on the string is

A. $77m/s$

B. $102m/s$

C. $110m/s$

D. $165m/s$

Answer: C

Watch Video Solution

3. If the tension and diameter of a sonometer wire of fundamental frequency n are doubled and density is halved then its fundamental frequency will become

A. $n/4$

B. $\sqrt{2}n$

C. n

D. $n/\sqrt{2}$

Answer: C

Watch Video Solution

4. A source and a detector moveaway fro each other, each with a speed of $10ms^{-1}$ with respect to the grond with no wind. If the detector detects a frequency 1950 Hz of the sound coming from thesorce, what is the original frequency of the source? Speed of sound in air $= 340ms^{-1}$.

A. $1950Hz$

B. $2068Hz$

C. $2132Hz$

D. $2586Hz$

Answer: B

Watch Video Solution

5. A wave travelling in positive X-direction with $A = 0.2m$ has a velocity of $360m/\sec$ if $\lambda = 60m$, then correct exression for the wave is

A. $y=0.2\sin\left[2\pi\left(6t+\frac{x}{60}\right)\right]$

B. $y=0.2\sin\left[\pi\left(6t+\frac{x}{60}\right)\right]$

C. $y=0.2\sin\left[2\pi\left(6t-\frac{x}{60}\right)\right]$

D. $y=0.2\sin\left[\pi\left(6t-\frac{x}{60}\right)\right]$

Answer: C

Watch Video Solution

6. A whistle revolves in a circle with an angular speed of $20 rad / \sec$ using a string of length $50 cm$. If the frequency of sound from the whistle is $385 Hz$, then what is the minimum frequency heard by an observer which is far away from the centre in the same plane? $v = 340 m / s$

A. $333 Hz$

B. $374 Hz$

C. $385 Hz$

D. $394 Hz$

Answer: B

Watch Video Solution

7. An observer moves towards a stationary source of sound with a speed $\left(\frac{1}{5}\right)$th of the speed of sound. The wavelength and frequency of the source emitted are λ and f, respectively. The apparent frequency and wavelength recorded by the observer are, respectively.

A. $1.2f, \lambda$

B. $f, 1.2\lambda$

C. $0.8f, 0.8\lambda$

D. $1.2f, 1.2\lambda$

Answer: A

Watch Video Solution

8. A car is moving towards a high cliff. The car driver sounds a horn of frequency f. The reflected sound heard by the driver has a frequency $2f$. if v be the velocity of sound, then the velocity of the car, in the same velocity units, will be

A. $\frac{v}{\sqrt{2}}$

B. $\frac{v}{3}$

C. $\frac{v}{4}$

D. $\frac{v}{2}$

Answer: B

Watch Video Solution

9. The two waves are represented by

$$y_1 = 10^{-6}\sin\left(100t + \frac{x}{50} + 0.5\right)m$$

$$Y_2 = 10^{-2}\cos\left(100t + \frac{x}{50}\right)m$$

where x is ihn metres and t in seconds. The phase difference between the waves is approximately:

A. $1.07 rad$

B. $2.07 rad$

C. $0.5 rad$

D. $1.5 rad$

Answer: A

Watch Video Solution

10. Two vibrating tuning forks produce progressive waves given by $y_1 = \sin 500\pi t$ and $y_2 = 2\sin 506\pi t$. Number of beats produced per minute is:

A. 360

B. 180

C. 3

D. 60

Answer: B

Watch Video Solution

11. A point source emits sound equally in all directions in a non-absorbing medium. Two point P and Q are at distance of $2m$ and $3m$ respectively from the source. The ratio of the intensities of the wave at P and Q is :

A. $9:04:00AM$

B. $2:03:00AM$

C. $3:02:00AM$

D. $4:09:00AM$

Answer: A

Watch Video Solution

12. Which one of the following statements is true?

A. both light and sound waves in air are transverse

B. the sound waves in air are longitudinal while the light waves are transverse

C. both light and sound waves in air are longitudinal

D. both light and sound waves can travel in vacuum

Answer: B

Watch Video Solution

13. A transverse wave propagating along x-axis is represented by: $y(x, t) = 8.0 \sin\left(0.5\pi x - 4\pi t - \frac{\pi}{4}\right)$ Where

x is in metres and t is in seconds. The speed of the wave is:

A. $4\pi m / s$

B. $0.5\pi m / s$

C. $\pi / 4m / s$

D. $8m / s$

Answer: D

Watch Video Solution

14. The time of reverberation of a room A is one second. What will be the time (in seconds) of reverberation of room, having all the dimensions double of those of room A?

A. 2

B. 4

C. $\frac{1}{2}$

D. 1

Answer: A

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15. Two sound waves with wavelengths $5.0m$ and $5.5m$ respectively, each propagates in a gas with velocity $30m/s$ We expect the following number of beats per second:

A. 12

B. 0`

C. 1

D. 6

Answer: D

Watch Video Solution

16. Two points are located at a distance of $10m$ and $15m$ from the source of oscillation. The period of oscillation is 0.05s and the velocity of the wave is $300m/s$. What is the phase difference between the oscillation of two points?

A. $\frac{\pi}{3}$

B. $\frac{2\pi}{3}$

C. π

D. $\frac{\pi}{6}$

Answer: B

Watch Video Solution

17. The wave described by $y = 0.25 \sin(10\pi x - 2\pi t)$. Where x and y are in metre and t is second, is a wave travelling along the

A. $-ve$ x direction with frequency $1Hz$

B. $+ve$ x direction with frequenc πHz and wavelength $\lambda = 0.2m$

C. $+ve$ x direction with frequency $1Hz$ and wavelength $\lambda = 0.2m$

D. $-ve$ x direction with amplitude $0.25m$ and wavelength $\lambda = 0.2m$

Answer: C

Watch Video Solution

18. Each of the strings of length $51.6cm$ and $49.1cm$ are tensioned separately by $20N$ force. Mass per unit length of both the strings is the same and equal to $1gm^{-1}$. When both the strings vibrate simultaneoulsy the number of beats is

A. 5

B. 7

C. 8

D. 3

Answer: B

Watch Video Solution

19. The driver of a car travelling with speed $30ms^{-1}$ towards a hill sounds a horn of frequency 600 Hz. If the velocity of sound in air is $330ms^{-1}$, the frequency of reflected sound as heard by driver is

A. $550Hz$

B. $555.5Hz$

C. $720Hz$

D. $500Hz$

Answer: C

Watch Video Solution

20. A wave in a string has an amplitude of $2cm$. The wave travels in the $+ve$ direction of x axis with a speed of $128ms^{-1}$ and it is noted that 5 complete waves fit in $4m$ length of the string. The equation describing the wave is

A. $y = (0.02)m \sin(7.85x + 1005t)$

B. $y = (0.02)m \sin(15.7x - 2010t)$

C. $y = (0.02)m \sin(15.7x + 2010t)$

D. $y = (0.02)m \sin(7.85x - 1005t)$

Answer: D

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21. A transverse wave is represented by $y = A\sin(\omega t - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity?

A. $\pi A / 2$

B. πA

C. $2\pi A$

D. A

Answer: C

Watch Video Solution

22. A tuning fork of frequency 512 Hz makes 4 beats//s with the vibrating string of a piano. The beat frequency decreases to 2 beats//s when the tension in the piano string is slightly increased.The frequency of the piano string before increasing the tension was

A. $510 Hz$

B. $514 / Hz$

C. $516 Hz$

D. $508 Hz$

Answer: D

Watch Video Solution

23. Two waves are represented by the equations $y_1 = a\sin(\omega t = kx + 0.57)m$ and $y_2 = a\cos(\omega t + kx)$m where x is in metre and t in second. The phase difference between them is

A. $1.25 rad$

B. $1.57 rad$

C. $0.57 rad$

D. $1.0 rad$

Answer: D

Watch Video Solution

24. Sounds waves travel at $350 m/s$ through a warm air and at $3500 m/s$ through brass. The wavelength of a $700 Hz$. Acoustic wave as it enters brass from warm air

A. increases by a factor 20

B. increases by a factor 10

C. decreases by factor 20

D. decreases by a factor 10

Answer: B

Watch Video Solution

25. The identical piano wires kept under the same tension T have a fundamental frequency of 600 Hz. The fractional increase in the tension of one of the wires which will lead to occurrence of 6 beats//s when both the wires oscillate together would be

A. 0.02

B. 0.03

C. 0.04

D. 0.01

Answer: A

Watch Video Solution

26. When a string is divided into three segments of length l_1, l_2 and l_3 the fundamental frequencies of these three segments are f_1, f_2 and f_3 respectively. The original fundamental frequency f of the string is

A. $\frac{1}{\sqrt{f}} = \frac{1}{\sqrt{f_1}} + \frac{1}{\sqrt{f_2}} + \frac{1}{\sqrt{f_3}}$

B. $\sqrt{f} = \sqrt{f_1} + \sqrt{f_2} + \sqrt{f_3}$

C. $f = f_1 + f_2 + f_3$

D. $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$

Answer: D

Watch Video Solution

27. Two sources of sound placed close to each other are emitting progressive waves given by $y_1 = 4\sin 600\pi t$ and $y_2 = 5\sin 608\pi t$. An observer located near these two sources of sound will hear:

A. 4 beats per second with intensity ratio 81:1 between waxing and waning

B. 4 beats per second with intensity ratio 25:16 between waxing and waning

C. 8 beats per second with intensity ratio 25:16 between waxing and waning

D. 8 beats per second with intensity ratio $81:1$ between waxing and waning

Answer: A

Watch Video Solution

28. A train moving at a speed of $220ms^{-1}$ towards a stationary object emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is (speed of sound in air is $330ms^{-1}$)

A. $3500Hz$

B. $4000Hz$

C. $5000Hz$

D. $3000Hz$

Answer: C

Watch Video Solution

29. If we study the vibration of a pipe open at both ends, then the following statements is not true?

A. Open end will be antinode

B. Odd harmonics of the fundamental frequency will be generated

C. All harmonics of the fundamental frequency will be generated

D. Pressure change will be maximum at both ends

Answer: D

Watch Video Solution

30. A source of unknown frequency gives 4 beats//s, when sounded with a source of known frequency 250 Hz. The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 The unknown frequency is

A. $254Hz$

B. $246Hz$

C. $240Hz$

D. $260Hz$

Answer: A

Watch Video Solution

31. A wave travelling in the $+ve$ x-direction having displacement along y-direction as 1m, wavelength 2π m and frequency of $1/\pi$ Hz is represented by

A. $y = \sin(x - 2t)$

B. $y = \sin(2\pi x - 2\pi t)$

C. $y = \sin(10\pi x - 20\pi t)$

D. $y = \sin(2\pi x + 2\pi t)$

Answer: A

Watch Video Solution

32. If n_1, n_2 and n_3 are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by

A. $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

B. $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$

C. $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$

D. $n = n_1 + n_2 + n_3$`

Answer: A

Watch Video Solution

33. The number of possible natural oscillations of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are (velocity of sound $= 340 ms^{-1}$).

A. 4

B. 5

C. 7

D. 6

Answer: D

Watch Video Solution

34. A speed ign motorcyclist sees traffic ham ahead of him. He slows doen to $36km/h$ He finds that traffic has eased and a car moving ahead of him at $18km/h$ is honking at a frequency of 1392 Hz. If the speed of sound is $343m/s$, the frequency of the honk as heard by him will be

A. $1332Hz$

B. $1372Hz$

C. $1412Hz$

D. $1454Hz$

Answer: C

Watch Video Solution

35. The fundamental frequency of a closed organ pipe of length $20cm$ is equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is

A. $80cm$

B. $100cm$

C. $120cm$

D. $140cm$

Answer: C

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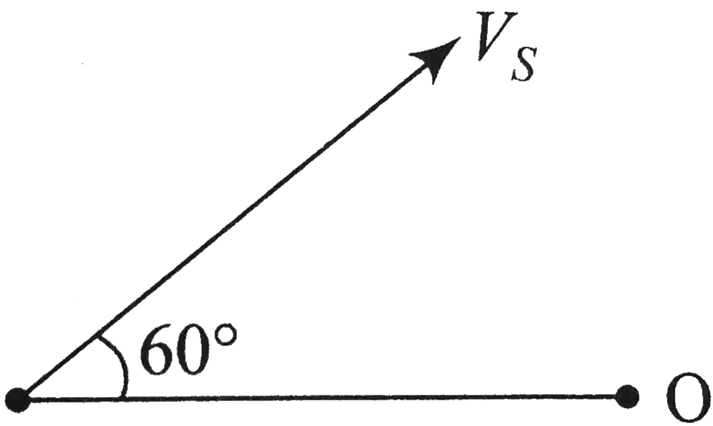
36. 

A source of sound S emitting waves of frequency $100 Hz$ and an observer O are located at some distance from each other. The source is moving with a speed of $19.4 ms^{-1}$ at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air $330ms^{-1}$) is

A. $97Hz$

B. $100Hz$

C. $103Hz$

D. $106Hz$

Answer: C

Watch Video Solution

37. A string is stretched between fixed points separated by $75.0cm$. It is observed to have resonant frequencies of $420Hz$ and $315Hz$. There are no other resonant frequencies between these two. Then, the lowest resonant frequency for this string is

A. $105Hz$

B. $155Hz$

C. $205hz$

D. $10.5hz$

Answer: A

Watch Video Solution

38. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of $15ms^{-1}$. Then the frequency of sound that the observer hears in the echo reflected from the cliff is (Take velocity of sound in air $= 330ms^{-1}$)

A. $885Hz$

B. $765Hz$

C. $800Hz$

D. $838Hz$

Answer: D

Watch Video Solution

39. A uniform rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_2 is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2. The ratio $\frac{\lambda_2}{\lambda_1}$ is

A. $\sqrt{\frac{m_1}{m_2}}$

B. $\sqrt{\frac{m_1 + m_2}{m_2}}$

C. $\sqrt{\frac{m_2}{m_1}}$

D. $\sqrt{\frac{m_1 + m_2}{m_1}}$

Answer: B

Watch Video Solution

40. An air column, closed at one end and open at the other resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is

A. $66.7cm$

B. $100cm$

C. $150cm$

D. $200cm$

Answer: C

Watch Video Solution

41. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be

A. $\frac{L}{2}$

B. $4L$

C. L

D. $2L$

Answer: D

Watch Video Solution

42. Three sound waves of equal amplitudes have frequencies $(v-1), v, (v+1)$. They superpose to give beats. The number of beats produced per second will be :

A. 3

B. 2

C. 1

D. 4

Answer: B

Watch Video Solution

43. The two nearest harmonics of a tube closed at one end and open at other end are 220 Hz and 260 Hz. What is the fundamental frequency of the system?

A. $20Hz$

B. $30Hz$

C. $40Hz$

D. $10Hz$

Answer: A

Watch Video Solution

44. Two car moving in opposite directions approach each other with speed of $22m/s$ and $16.5m/s$ respectively. The driver of the first car blows a horn having a frequency

$400 Hz$. The frequency heard by the driver of the second car is [velocity of sound $340 m / s$].

A. $361 Hz$

B. $411 Hz$

C. $448 Hz$

D. $350 Hz$

Answer: C

Watch Video Solution

45. A tuning fork is used to produce resonance in glass tuve. The length of the air column in the tube can be adjusted by a variable piston. At room temperature of $27^{\circ} C$ two succesive resonance are produced at 20 cm and 73 cm column length. If the frequency of the tuning fork is 320 Hz. the velocity of sound is air at $27^{\circ} C$ is

A. $300m / s$

B. $330m / s$

C. $350m / s$

D. $339m/s$

Answer: D

Watch Video Solution

46. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is

A. $13.2cm$

B. $8cm$

C. $12.5cm$

D. $16cm$

Answer: B

Watch Video Solution

Chapter Test

1. The temperature at which the speed of sound in air becomes double of its value at

$0^{\circ} C$ is

A. 273 K

B. 546 K

C. 1092 K

D. 0 K

Answer: C

Watch Video Solution

2. A tuning fork arrangement (pair) produces $4 beats / \sec$ with one fork of frequency $288 cps$. A little wax is placed on the unknown fork and it then produces $2 beats / \sec$. The frequency of the unknown fork is

A. 286 cps

B. 292 cps

C. 294 cps

D. 288 cps

Answer: B

Watch Video Solution

3. When temperature increases, the frequency of a tuning fork

A. increases

B. decreases

C. remains same

D. increases or decreases depending on the material

Answer: B

Watch Video Solution

4. A wave representing by the equation $y = a\cos(kx - \omega t)$ is suerposed with another wave to form a stationary wave such that point $x = 0$ is a node. The equation for the other wave is

A. $y = a\sin(kx - \omega t)$

B. $y = -a\cos(kx + \omega t)$

C. $y = -a\cos(kx - \omega t)$

D. $y = -a\sin(kx - \omega t)$

Answer: B

Watch Video Solution

5. Length of a string tied to two rigid support is $40cm$. Maximum length (wavelength in cm) of a stationary wave produced on it is

A. 20

B. 80

C. 40

D. 120

Answer: B

Watch Video Solution

6. Tube A has both ends open while tube B has one closed, otherwise they are identical. The ratio of fundamental frequency of tube A and B is

A. $1:2$

B. $1:4$

C. $2:1$

D. $4:1$

Answer: C

Watch Video Solution

7. A metal wire of linear mass density of $9.8g/m$ is stretched with a tension of $10kg-wt$ between two rigid support $1meter$

apart. The wire passes at its middle point between the poles of a permanent magnet, and it vibrates in resonance when carrying an alternating current of frequency n. the frequency n of the alternating source is

A. 25 Hz

B. 50 Hz

C. 100 Hz

D. 200 Hz

Answer: B

Watch Video Solution

8. The displacement y of a wave travelling in the x-direction is given by $y=10^{-4}\sin\left(\left(600t-2x+\frac{\pi}{3}\right)meters\right.$ where x is expressed in meters and t in seconds. The speed of the wave-motion, in ms^{-1}, is

A. 200

B. 300

C. 600

D. 1200

Answer: B

Watch Video Solution

9. A tuning fork of known frequency $256Hz$ makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

A. $256 + 5Hz$

B. $256 + 2Hz$

C. $256 - 2Hz$

D. $256 - 5Hz$

Answer: D

Watch Video Solution

10. The displacement y of a partcle in a medium can be expressed as, $y = 10^{-6} \sin\left(\left(100t + 20x + \frac{\pi}{4}\right)m\right.$ where t is in second and x in meter. The speed of the wave is

A. $2000m / s$

B. $5m / s$

C. $20m / s$

D. $5\pi m / s$

Answer: B

Watch Video Solution

11. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

A. 5%

B. 20%

C. zero

D. 0.5%

Answer: B

Watch Video Solution

12. A wave equation which gives the displacement along the Y direction is given by the equation $y = 10^4 \sin(60t + 2x)$, where x and y are in metres and t is time in seconds. This represents a wave

A. travelling with a velocity of $30m/s$ in the negative X direction

B. of wavelength 2π metre

C. of frequency $60 / \pi Hz$

D. Of amplitude 10^4 metre travelling along the positive X direction

Answer: A

Watch Video Solution

13. A travelling wave is described by the equation $y = y_0 \sin\left(\left(ft - \frac{x}{\lambda}\right)\right)$. The maximum particle velocity is equal to four times the wave velocity if

A. $\lambda = \frac{\pi Y_0}{4}$

B. $\lambda = \frac{\pi y_0}{2}$

C. $\lambda = \pi Y_0$

D. $\lambda = 2\pi Y_0$

Answer: B

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14. A wave representing by the equation $y = a\cos(kx - \omega t)$ is suerposed with another wave to form a stationary wave such that point $x = 0$ is a node. The equation for the other wave is

A. $y = a\sin(kx + \omega t)$

B. $y = -a\cos(kx + \omega t)$

C. $y = -a\cos(kx - \omega t)$

D. $y = -a\sin(kx - \omega t)$

Answer: B

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15. Two travelling waves $y_1 = A\sin[k(x - ct)]$ and $y_2 = A\sin[k(x + ct)]$ are superimposed on string. The distance between adjacent nodes is

A. ct / π

B. $ct / 2\pi$

C. $\pi / 2k$

D. π / k

Answer: D

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16. A whistle giving out $450 H_Z$ approaches a stationary observer at a speed of $33 m / s$. The frequency heard the observer (in H_Z) is (speed of sound $= 330 m / s$)

A. 409

B. 429

C. 517

D. 500

Answer: D

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17. A travelling wave in a stretched string is described by the equation $y = A\sin(kx - \omega t)$ the maximum particle velocity is

A. $A\omega$

B. ω / k

C. $d\omega / dk$

D. x / t

Answer: A

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18. The ratio of the speed of sound in nitrogen gas to that in helium gas, at 300K is

A. $\sqrt{2 / 7}$

B. $\sqrt{1/7}$

C. $\sqrt{3}/5$

D. $\frac{\sqrt{6}}{5}$

Answer: C

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19. Two monoatomic ideal gases 1 and 2 of molecular masses m_1 and m_2 respectively are enclosed in separate containers kept at the same temperature. The ratio of the of sound in gas 1 to that in gas 2 is given by

A. $\sqrt{\frac{m_1}{m_2}}$

B. $\sqrt{\frac{m_2}{m_1}}$

C. $\frac{m_1}{m_2}$

D. $\frac{m_2}{m_1}$

Answer: B

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20. Two vibrating strings of the same material but lengths L and $2L$ have radii $2r$ and r respectively. They are stretched under the same tension. Both the string vibrate in their fundamental nodes, the one of length L with freuqency v_1 and the other with frequency v_2. the ratio v_1 / v_2 is given by

A. 2

B. 4

C. 8

D. 1

Answer: D

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21. A train moves towards a stationary observer with speed $34m/s$. The train sounds a whistle and its frequency registered by the observer is f_1. If the train's speed is reduced to $17m/s$, the frequency registered is f_2. If the speed of sound of $340 m / s$, then the ratio f_1 / f_2 is

A. $18 / 19$

B. $1 / 2$

C. 2

D. $\frac{19}{18}$

Answer: D

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22. The ends of a stretched wire of length L are fixed at $x = 0$ and $x = L$. In one experiment, the displacement of the wire is $y_1 = A\sin(\pi x / L)\sin\omega t$ and energy is E_1 and in another experiment its displacement is $y_2 = A\sin(2\pi x / L)\sin 2\omega t$ and energy is E_2. Then

A. $E_2 = E_1$

B. $E_2 = 2E_1$

C. $E_2 = 4E_1$

D. $E_2 = 16E_1$

Answer: C

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23. A siren placed at a railway platform is emitting sound of frequency $5kHz$. A passenger sitting in a moving train A records a frequency of $5.5kHz$ while the train approaches the siren. During his return journey in a different train B he records a frequency of $6.0 kHz$ while approaching the same siren. the ratio the velocity of train B to that of train A is

A. $242/252$

B. 2

C. $5/6$

D. $11/16$

Answer: B

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24. A sonometer wire resonates with a given tuning fork forming standing waves with five antitodes between the two bridges when a mass of $9kg$ is suspended from the wire. when this same tuning fork forming three antitodes for the same positions of the bridges. the value of M is

A. $25kg$

B. $5kg$

C. $12.5kg$

D. $1/25kg$

Answer: A

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25. In the experiment for the determination of the speed of sound in air using the resonance column method, the length of the air column that resonates in the fundamental mode, with a tuning fork is $0.1m$. When this length is changed to $0.35m$, the same tuning fork resonates with the first overtone. Calculate the end correction.

A. $0.012m$

B. $0.025m$

C. $0.05m$

D. $0.024m$

Answer: B

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26. A closed organ pipe of length L and an open organ pipe contain gass of densities ρ_1 and ρ_2, respectively. The compressibility of gass are equal in both the pipes. Both the pipes are vibrating in their first overtone with same frequency . The length of the open orange pipe is

(a) $\frac{L}{3}$

$\frac{4l}{3}$

(c) $\frac{4l}{3}\sqrt{\frac{\rho_1}{\rho_2}}$

(d) $\frac{4l}{3}\sqrt{\frac{\rho_2}{\rho_1}}$

A. $\frac{L}{3}$

B. $\frac{4L}{3}$

C. $\frac{4L}{3}\sqrt{\frac{\rho_1}{\rho_2}}$

D. $\frac{4L}{3}\sqrt{\frac{\rho_2}{\rho_1}}$

Answer: C

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27. A source emits sound of frequency 600Hz inside water. The frequency heard in air will be equal to (velocity of sound in water $= 1500(m)/(s)$, velocity of sound in air=300 $(m)/(s)$)

A. 200 Hz

B. 3000 Hz

C. 120 Hz

D. 600 Hz

Answer: D

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28. If in an experiment for determination of velocity of sound by resonance tube method using a tuning fork of $512Hz$, first resonance was observed at$30.7cm$ and second was obtained at $63.2 cm$, then maximum possible error in velocity of sound is (consider actual speed of sound in air is `332m//s

A. $204 cm / \sec$

B. $110 cm / \sec$

C. $58 cm / \sec$

D. $80 cm / \sec$

Answer: D

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29. Assertion: Transverse waves are not produced in liquids and gases.

Reason: Light waves are transverse waves.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: B

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30. . Assertion: The velocity of sound increases with increases in humidity.

Reason: Velocity of sound does not depend upon the medium.

A. if both the assertion and reason are true and reson is a true explanation of the assertion.

B. if both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If both the assertion and reason are false.

Answer: C

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