PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

WAVE MOTION

Multiple Choice Questions

1. The angle between particle velocity and wave velocity in transverse wave is

A. zero

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

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

D. p

Answer: C

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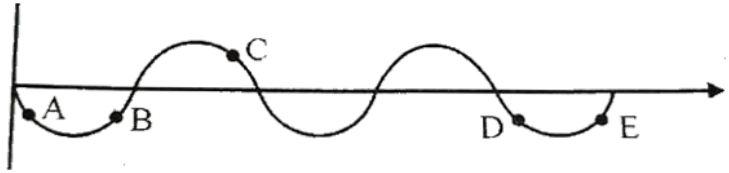
2. The diagram shows the propagation of a progressive wave A, B, C, D, E, are five points on this wave



Which points are in the same state of vibration?

A. A, B

B. B, C

C. B, D

D. E, B

Answer: D

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3. If the pressure amplitude in a sound wave is tripled, then by what factor the intensity of sound wave is increased?

A. 2

B. 6

C. 4

D. 8

Answer: C

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4. The speed of sound in air and water is 340 m/s. and 1420 m/s respectively. If sound waves have a wavelength of 2m in air, then the frequency of the same sound waves in water will be

A. 100 Hz

B. 125 Hz

C. 340 Hz

D. 170 Hz

Answer: D

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5. The frequency of a tuning fork is 220 Hz and the velocity of sound in air is 330 m/s. When the tuning fork completes 80 vibrations, the distance travelled by the wave is

A. 100 m

B. 120 m

C. 140 m

D. 160 m

Answer: B

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6. Frequency of audible sound waves ranges between 20 Hz and 20 KHz. If the velocity of sound in air is 320 m/s, the range of the wavelengths of the sound in air is

A. 1.6 cm to 16 m

B. 1.6 m to 16 m

C. 16 cm to 16 m

D. 16 mm to 16 m

Answer: A

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7. The frequency of the sinusoidal wave

$y = 0.40\cos[2000t + 0.80x]$ would be

A. 1000 Hz

B. 2000 Hz

C. $\frac{1000}{\pi} Hz$

D. $\frac{2000}{\pi} Hz$

Answer: C

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8. What is the phase difference between two simple harmonic motions represented by $x_1 = A\sin\left(\omega t + \frac{\pi}{6}\right)$ and $x_2 = A\cos\omega t$?

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

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

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

D. π

Answer: C

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9. A wave of frequency 500 Hz has velocity 360 m/sec. The distance between two nearest points 60° out of phase, is

A. 3 cm

B. 6 cm

C. 12 cm

D. 24 cm

Answer: C

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10. When a sound wave of frequency 300 Hz passes through a medium the maximum displacement of a particle of the medium is 0.1 cm . The maximum velocity of the particle is equal to

A. $3\pi cm/s$

B. $4\pi cm/s$

C. $6\pi cm/s$

D. $6cm/s$

Answer: C

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11. The ratio of ω/k for a travelling wave (where ω is the angular frequency and k is the angular wave number) is .....

A. $V = \frac{K}{\omega}$

B. $V = \frac{\omega}{K}$

C. $V = \sqrt{\frac{K}{\omega}}$

D. $V = \sqrt{\frac{\omega}{K}}$

Answer: B

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12. In a medium, the phase difference between two particles separated by a distance x is $\frac{\pi}{6}$. If the frequency of the oscillation is 25 Hz and the velocity of propagation of the wave is 100 m/s then the value of x is equal to

A. $\frac{1}{3}m$

B. $\frac{1}{4}m$

C. $\frac{1}{6}m$

D. $\frac{1}{8}m$

Answer: A

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13. If the ratio of the amplitudes of two waves is $4:3$, then the ratio of the maximu and minimum intensities is

A. $1:49$

B. $49:1$

C. $16:9$

D. $5:4$

Answer: B

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14. The particles of a medium vibrate about their mean positions whenever a wave travels through that medium. The phase difference between the vibrations of two such particles

A. is always zero

B. varies with time

C. varies with distance separating them

D. varies with time as well as distance

Answer: D

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15. The displacement y (in cm) produced by a simple harmonic progressive wave is

$$y = \frac{10}{\pi}\sin\left(2000\pi t - \frac{\pi x}{15}\right)$$

What is the periodic time and maximum velocity of the particles in the medium ?

A. 10^{-2} sec and 2000 m/s

B. 10^{-3} sec and 200 m/s

C. 10^{-3} sec and 300 m/s

D. 10^{-4} sec and 200 m/s

Answer: B

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16. A wave is represented by the equation $y = 0.5\sin(10t - x)m$. It is a travelling wave propagating along the + x direction with velocity

A. 5 m/s

B. 10 m/s

C. 20 m/s

D. 15 m/s

Answer: B

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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. $\frac{d\omega}{dK}$

B. $\frac{\omega}{K}$

C. $A\omega$

D. $\frac{x}{t}$

Answer: C

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18. In a medium sound travels 2 km in 3 sec and in air, it travel 3 km in 10 sec . The ratio of the wavelengths of sound in the two media is

A. $1:8$

B. $1:18$

C. $8:1$

D. $20:9$

Answer: D

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19. When sound waves are reflected from a denser medium

A. crest is reflected as a trough

B. crest is reflected as a crest

C. compression is reflected as a rarefaction

D. compression is reflected as a compression

Answer: D

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20. When a longitudinal wave is reflected from a rarer medium

A. compression is reflected as rarefaction with a phase change

B. compression is reflected as compression without a phase change

C. compression is reflected as compression with a phase change

D. compression is reflecte as rarefaction without a phase change

Answer: D

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21. A sine wave is travelling ina medium. The minium distance between the two particles, always having same speed is

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

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

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

D. λ

Answer: B

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22. What is the phase difference between two successive crests in the wave

A. 2π radian

B. 4π radian

C. π radian

D. $\pi / 2$ radian

Answer: A

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23. A note has a frequency of 128 Hz. What is the frequency of a note two octaves higher than it?

A. 32 Hz

B. 64 Hz

C. 512 Hz

D. 256 Hz

Answer: C

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24. If wavelength of a wave is $\lambda = 6000\text{Å}$.Then wave number will be

A. $16.6 \times 10^{1} m^{-1}$

B. $1.66 \times 10^{6} m^{-1}$

C. $1.66 \times 10^{7} m^{-1}$

D. $1.66 \times 10^{3} m^{-1}$

Answer: B

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25. A wave given by the equation $y = A\cos(\omega t - \phi)$, is totally reflected by the closed end of a metal pipe. After reflection

A. ω changes

B. only ϕ changes

C. both ω and ϕ changes

D. ϕ does not change

Answer: B

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26. A travelling wave has the frequency v and the particle displacement amplitude A. For the wave the particle velocity amplitude is ..... and the particle acceleration amplitude is .....

A. $2\pi vA$

B. $4\pi^2 v^2 A$

C. $\frac{4\pi^2}{v^2 A}$

D. $4\pi v^2 A$

Answer: B

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

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

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

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

Answer: A

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28. A wave equation which gives the displacement along y - direction is given by $y = 0.001\sin(100t + x)$ where x and y are in meterand t is time in second. This represented a wave

A. of wavelength one metre

B. travelling with a velocity of 100 m/s in the negative X-direction

C. of frequency $\frac{100}{\pi} Hz$

D. travelling with a velocity of $\frac{50}{\pi} m/s$ in the positive X-direction

Answer: B

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29. A muscial instrument P produces sound waves of frequency n and amplitude A. Another musical instrument Q produces sound waves of frequency $\frac{n}{4}$. The waves produced by P and Q have equal energies. If the amplitude of waves produced by p is A_P, then the amplitude of waves produced by Q will be

A. $2A_P$

B. $4A_P$

C. $6A_P$

D. $9A_P$

Answer: B

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30. The waves produced by a motor boat sailing in water are :

A. Stationary

B. Transverse

C. Longitudinal

D. Both longitudinal and transverse

Answer: D

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31. A plane progressive wave of frequency 25 Hz, amplitude $2.5 \times 10^{-5} m$ and initial phase zero moves along the negative x-direction with a velocity of 300 m/s. A and B are two points 6 m apart on the line of propagation of the wave. At any instant the phase different between A and B is ϕ. The maximum difference in the displacements of particle at A and B is Δ

A. $\frac{\pi}{2}$ $\mathrm{rad} 0.5 \times 10^{-5} m$

B. $\frac{\pi}{3}$ $\mathrm{rad} 10^{-5} m$

C. $\frac{\pi}{4}$ rad and zero

D. π rad and zero

Answer: D

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

A. amplitude $\frac{A}{2}$ and frequency n

B. amplitude A and frequency 2n

C. amplitude $\frac{A}{2}$ and frequency 2n

D. amplitude A and frequency n

Answer: C

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33. When a longitudinal wave propagates through a medium, the particles of the medium execute simple harmonic oscillations about their mean positions. These oscillations of a particle are characterised by an invariant

A. Kinetic energy (K)

B. Potential energy (U)

C. $(K - U)$

D. $(K + U)$

Answer: D

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34. A light pointer fixed to one prong of a tuning fork touches gnetly a smoked vertical plate. The fork is set vibrating and the

plate is allowed to fall freely. 8 complete oscilllations are counted when the plate falls through 10cm.What is the frequency of the tuning fork?

A. 280 Hz

B. 560 Hz

C. 56 Hz

D. 360 Hz

Answer: C

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35. A uniform rope of length 12 mm and mass 6 kg hangs vertically from a rigid support. A block of mass 2 kg is attached to the free end of the rope. A transverse pulse of wavelength

0.06 m is produced at the lower end of the rope. What is the wavelength of the pulse when it reaches the top of the rope?

A. 0.6 m

B. 0.32 m

C. 0.24 m

D. 0.12 m

Answer: D

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36. The equation of a progressive wave is $y = 8\sin\left[\pi\left(\frac{t}{10} - \frac{x}{4}\right) + \frac{\pi}{3}\right]$. The wavelength of the wave is

A. 2m

B. 4m

C. 8m

D. 16m

Answer: C

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37. A progressive wave of frequency 50 Hz is travelling with a velocity of 350 m/s. through a medium. What is the change in phase at a given place in time interval of 0.01 second ?

A. $\frac{\pi}{4}$ radian

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

C. π radian

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

Answer: C

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38. From a wave equation

$$y = 0.5 \sin\left(\frac{2\pi}{3.2}\right)(64t - x).$$

the frequency of the wave is

A. 50 Hz

B. 500 Hz

C. 250 Hz

D. 100 Hz

Answer: B

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39. The equation of a simple harmonic progressive wave is $y = \sin\frac{\pi}{2}\left[\frac{4t}{0.025} - \frac{x}{0.25}\right]$ where all the quantities are in SI units. What is the amplitude and frequency of the wave ?

A. 2m, 2Hz

B. 1m, 80 Hz

C. 1m, 40 Hz

D. 2m, 40 Hz

Answer: C

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40. The equation of a progressive wave is $y = A\sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$. In terms of frequency and velocity of the wave, this equation is written as:

A. $y = A \sin 2\pi n\left(t - \frac{v}{x}\right)$

B. $y = A \sin 2\pi n\left(t - \frac{x}{v}\right)$

C. $y = A \sin 2\pi\left(nt - \frac{x}{v}\right)$

D. $y = 2A \sin \pi\left(nt = \frac{x}{v}\right)$

Answer: B

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41. The equation of a progressive wave is

$$y = A \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$$

This equations can be expressed in terms of wavelength and velocity of the wave as

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

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

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

D. $y = 2A\sin\frac{2\pi}{\lambda}(v - xt)$

Answer: C

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42. The equation of a simple harmonic progressive wave having amplitude 5 mm, period 2 second and wavelength 2m and travelling along the positive direction of the x-axis is given by

A. $y = 5\sin 2\pi\left(\frac{t}{2} - \frac{x}{2}\right)$

B. $y = 5 \times 10^{-3}\sin 2\pi\left(2t - \frac{x}{2}\right)$

C. $y = 5 \times 10^{-3}\sin 2\pi\left(\frac{t}{2} - \frac{x}{2}\right)$

D. $y = 5 \times 10^{-3}\sin \pi(2t - x)$

Answer: C

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43. The equation of simple harmonic progressive wave, having amplitude $5 \times 10^{-2} m$, wavelength 30 cm, speed 50 m/s and travelling along the positive direction of the x-axis is given by

A. $y = 0.05 \sin \frac{2\pi}{0.3}[50t - x]$

B. $y = 0.05 \sin 2\pi \left[\frac{50t}{0.3} + \frac{x}{0.3}\right]$

C. $y = 0.05 \sin \frac{\pi}{0.3}(50t - x)$

D. $y = 0.05 \sin \frac{100\pi}{0.3}\left[t - \frac{x}{\lambda}\right]$

Answer: A

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44. Velocity of sound wave in air is 330 m/s for a particular sound in air.A path difference of 40 cm is equivalent to a phase difference of 1.6 π. The frewuency of this wave is

A. 150 Hz

B. 200 Hz

C. 660 Hz

D. 330 Hz

Answer: C

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45. A sound wave having a frequency of 500 Hz travels with a velocity of 360 m/s. What is the distance between two particles on this wave, who have a phase difference of 60° ?

A. 5 cm

B. 12 cm

C. 50 cm

D. 4.24 cm

Answer: B

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46. When a sound wave of frequency 200 Hz travels through a medium, the maximum displacement of a particle of the medium is 0.2 cm. The maximum velocity of the particle is

A. $20\pi cm / s$

B. $40\pi cm / s$

C. $80\pi cm / s$

D. $10\pi cm / s$

Answer: C

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47. Two sound waves are represented by

$y_1 = 10 \sin 2\pi(50t - 0.5x), y_2 = 30 \sin 2\pi(60t - 0.8x)$

The ratio of their intensities $\left(\frac{I_1}{I_2}\right)$ is

A. $1:3$

B. $1:4$

C. $1:9$

D. $3:1$

Answer: C

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48. The equation of a transverse wave is given by $y = 20 \sin \pi(4t - 0.04x)$ where x and y are in m and t is in sec. The frequency of the wave is

A. 1 Hz

B. 2 Hz

C. 3 Hz

D. 4 Hz

Answer: B

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49. If the equation of transverse wave is $y = 5\sin 2\pi\left[\frac{t}{0.04} - \frac{x}{40}\right]$, where distance is in cm and time in second, then the wavelength of the wave is

A. 40 cm

B. 25 cm

C. 60 cm

D. 10 cm

Answer: A

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50. The phase difference between two points is $\pi/3$. If the frequency of wave is 50 Hz, then what is the distance between

two points?

$(\text{Given, } \ v = 330ms^{-1})$

A. 1.1 m

B. 1.7 m

C. 2.2 m

D. 0.6 m

Answer: A

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51. 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. of amplitude $10^{-4}m$ travelling in the negative x direction

B. of wavelength π metre

C. of frequency $\frac{30}{\pi}$ hertz

D. travelling with a velocity of 30 m/s, in the positive x direction

Answer: D

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52. The equation of a transverse wave travelling along a string is given by $y = 5\cos\pi(100t - x)cm$. Its wavelength is

A. 10 cm

B. 5 cm

C. 3 cm

D. 2 cm

Answer: D

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53. The equation of a progressive wave along a string is $y = 2 \times 10^{-6} \sin \pi \left(\frac{t}{0.002} - \frac{x}{60} \right)$ where x is in cm and t is in second. What is the phase difference at an instant between two points which are 2 cm apart ?

A. $\frac{\pi}{2}$ radian

B. $\frac{\pi}{15}$ radian

C. $\frac{\pi}{20}$ radian

D. $\frac{\pi}{30}$ radian

Answer: D

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54. A sound wave of frequency 20 Hz covers a distance AB of 300 m in 10s. What is the number of waves between A and B?

A. 100

B. 150

C. 250

D. 200

Answer: D

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55. Two sound waves of frequencies 100 Hz and 200 Hz, travel in the same medium at the same temperature. What is the ratio of their velocities?

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:4$

Answer: C

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56. The phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is 90° . Then the velocity of wave will be

A. 256 m/s

B. 384 m/s

C. 512 m/s

D. 700 m/s

Answer: B

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57. A simple harmonic progressive wave has a wavelength 40 cm, periodic time 10 s and zero initial phase. What is the phase of an oscillating particles at a distane of 10 cm form the source at an instant t = 5s ?

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

B. $\frac{\pi}{4}$ radian

C. $\frac{\pi}{3}$ radian

D. $\frac{\pi}{2}$ radian

Answer: D

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58. The equation of a progressive wave is given by, $y = 5\sin\pi\left(\frac{t}{0.02} - \frac{x}{20}\right)$ m, then the frequency of the wave is

A. 100 Hz

B. 50 Hz

C. 25 Hz

D. 10 Hz

Answer: C

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59. A transverse wave given by $y = 2\sin(0.01x + 30t)$ moves on a strected string from one end to another end in 0.5 sec. If x and y are in cm and t is in sec, then the length of the string is

A. 6 m

B. 9 m

C. 12 m

D. 15 m

Answer: D

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60. The relation between wave velocity and maximum particle velocity is

(Where V_p = Particle velocity, V = Wave velocity)

A. $V = \frac{2\pi A}{\lambda} V_P$

B. $V_P = \frac{2\pi A}{\lambda} V$

C. $V = \frac{\lambda}{2\pi A} V_P$

D. $V_P = \frac{\lambda V}{2\pi A}$

Answer: B

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61. If V is the velocity of the wave and ω is the angular velocity then the propagation constant (K) of the wave is given by

A. $K = \frac{V}{\omega}$

B. $K = \frac{\omega}{V}$

C. $K = 2\pi n$

D. $K = \frac{\lambda}{2\pi}$

Answer: B

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62. The equation of a progressive wave travelling on a strected string is $y = 10 \sin 2\pi \left(\frac{t}{0.02} - \frac{x}{100} \right)$ where x and y are in cm and t is in sec. What is the speed of the wave?

A. 500 cm/s

B. 50 m/s

C. 40 m/s

D. 400 m/s

Answer: B

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63. In a simple harmonic progressive wave, the maximum particle velocity is twice the wave velocity. If λ is the wavelength, then its amplitude is given by

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

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

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

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

Answer: A

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64. A simple harmonic progressive wave of frequency 100 Hz is travelling along the positive direction of the X axis. What is the propagation constant, if the velocity of the wave is 500 m/s ?

A. $\frac{2\pi}{5}$ per metre

B. $\frac{\pi}{5}$ per metre

C. $\frac{2\pi}{3}$ per metre

D. $\frac{3}{2\pi}$ per metre

Answer: A

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65. The equation of a transverse wave along a stretched string is given by

$$y = 15 \sin 2\pi \left(\frac{t}{0.04} - \frac{x}{40} \right) cm.$$

The velocity of the wave is

A. 10 m/s

B. 5 m/s

C. 15 m/s

D. 20 m/s

Answer: A

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66. A sound wave of frequency 160 Hz has a velocity of 320 m/s. When it travels in air, the particles having a phase difference of

90°, are separated by a distance of

A. 25 cm

B. 50 cm

C. 75 cm

D. 1 m

Answer: B

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67. A progressive wave is travelling along the positive direction of the x-axis. For this wave, amplitude = 5 cm, period = 0.2 s and wavelength = 30 cm

The equation of the wave using SI units is given by

A. $y = 0.05 \sin 2\pi \left(\frac{t}{0.2} - \frac{x}{0.3} \right)$

B. $y = 0.5 \sin 2\pi \left(\frac{t}{0.2} - \frac{x}{30} \right)$

C. $y = 5 \sin 2\pi \left(\frac{t}{0.2} + \frac{x}{3} \right)$

D. $y = 0.05 \sin 2\pi \left(\frac{x}{0.3} + \frac{t}{0.2} \right)$

Answer: A

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68. The equation of a progressive wave along a string is $y = 2 \times 10^{-6} \sin \pi \left(\frac{t}{0.002} - \frac{x}{60} \right)$ where x is in cm and t is in second. What is the phase difference at an instant between two points which are 2 cm apart ?

A. $\frac{\pi}{2}$ radian

B. $\frac{\pi}{15}$ radian

C. $\frac{\pi}{20}$ radian

D. $\frac{\pi}{30}$ radian

Answer: D

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69. In a wave equation, given by $y = A\sin(\omega t - Kx)$, y cannot represent

A. an electric field

B. a magnetic field

C. particle velocity

D. pressure

Answer: C

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70. In a simple harmonic progressive wave, the propagation constant is defined by $K = \frac{2\pi}{\lambda}$. What is the unit and dimensional formula of K?

A. degrees/cm, $[K] = \left[M^1 L^0 T^{-1}\right]$

B. radian/metre, $[K] = \left[M^0 L^{-1} T^0\right]$

C. per metre, $[K] = \left[M^0 L^1 T^0\right]$

D. radian metre, $[K] = \left[m^1 L^1 T^0\right]$

Answer: B

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71. 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. $\lambda = \frac{\pi a}{8}$

B. $\lambda = \frac{\pi a}{4}$

C. $\lambda = \frac{\pi a}{2}$

D. $\lambda = \frac{\pi a}{0.5}$

Answer: C

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72. The equation of a simple harmonic progressive wave is given by y = A sin $(100\pi t - 3x)$. Find the distance between 2 particles having a phase difference of $\frac{\pi}{3}$.

A. $\frac{\pi}{9}m$

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

C. $\frac{\pi}{6}m$

D. $\frac{\pi}{18}m$

Answer: A

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73. The equation of a simple harmonic progressive wave is given by $y = 12\sin(\omega t - 4x)$m. What is the distance between 2 particles on the wave, having a phase difference of $\pi/2$?

A. $\pi/2m$

B. $\pi/4m$

C. $\pi/6m$

D. $\pi/8m$

Answer: D

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74. 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. $5cms^{-1}$

B. $5\pi cms^{-1}$

C. $10cms^{-1}$

D. $10.5cms^{-1}$

Answer: B

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75. A wave is represented by the equation, $y = 0.1\sin(60t + 2x)$, where x and y are in metres and t is in seconds. This represents a wave

A. travelling with a speed of $\frac{1}{30}$ m/s, in the negative x direction

B. travelling with a speed of 30 m/s, in the positive x direction

C. of wavelength 30π metre

D. of frequency $\left(\frac{30}{\pi}\right)$ hertz

Answer: D

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

A. $\frac{x}{t}$

B. $\frac{d\omega}{dk}$

C. $\frac{\omega}{k}$

D. $A\omega$

Answer: D

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77. In a progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$ when and x are in metre, t is in second. What is the particle velocity amplitude?

A. $200\pi m/s$

B. $300\pi m/s$

C. $400\pi m/s$

D. $500\pi m / s$

Answer: D

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78. The equation of a progressive wave is $y = 8\sin\left[\pi\left(\frac{t}{10} - \frac{x}{4}\right) + \frac{\pi}{3}\right]$. The wavelength of the wave is

A. 10 m/s

B. 4 m

C. 8 m

D. 2 m

Answer: C

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79. The displacement of a particle in a medium can be expressed as

$y = 10^{-6} \sin(100t + 20x + \pi/4),$

where x is in metre and t is in second. What is the speed of the wave?

A. 5 m/s

B. 7.5 m/s

C. 10 m/s

D. 15 m/s

Answer: A

Watch Video Solution

80. A transverse wave is derscried by the equation $y = y_0 \sin 2\pi\left(ft - \frac{x}{\lambda}\right)$. The maximum particle velocity is equal to four times the wave velocity if :-

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

B. πy_0

C. $\lambda = \frac{4}{\pi y_0}$

D. $\lambda = \frac{4\pi}{y_0}$

Answer: A

Watch Video Solution

81. When a wave travels in a medium, the particle displacement is given by the equation

$y = a \sin 2\pi(bt - cx)$, where a, b and c are constants. The maximum particle velocity will be twice the wave velocity. If

A. $c = \frac{1}{\pi a}$

B. $c = \pi a$

C. $b = ac$

D. $b = \frac{1}{ac}$

Answer: A

Watch Video Solution

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

A. travelling with a velocity 30 m/s in the -ve direction of X axis

B. of wavelength $\frac{\pi}{2}m$

C. of amplitude $10^{-4}cm$

D. of frequency $30Hz$

Answer: A

Watch Video Solution

83. 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. πA

B. $\pi^2 A$

C. $\frac{\pi A}{2}$

D. πA^2

Answer: A

Watch Video Solution

84. The displacement y of a wave travelling in the x-direction is given by

$y = 10^{-4} \sin\left(600t - 2x + \frac{\pi}{3}\right) m$

Where x is expressed in metre and t in seconds. The speed of the wave motion in m/s is

A. 200

B. 1200

C. 600

D. 300

Answer: D

Watch Video Solution

85. A wave travelling along the x-axis is described by the equation $v(x, t) = 0.005\cos(\alpha x - \beta t)$. If the wavelength and the time period of the wave are $0.08m$ and $2.0s$, respectively, then α and β in appropriate units are

A. $\alpha = \frac{0.04}{\pi}, \beta = \frac{1.0}{\pi}$

B. $\alpha = \frac{0.08}{\pi}, \beta = \frac{2.0}{\pi}$

C. $\alpha = 25.00\pi, \beta = \pi$

D. $\alpha = 12.50\pi, b = \frac{\pi}{2.0}$

Answer: C

Watch Video Solution

86. 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. $y = (0.2)\sin(7.85x + 1005t)$

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

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

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

Answer: D

Watch Video Solution

87. The equation of a progressive wave is

$$y = 0.8 \sin 4\pi \left[t - \frac{x}{5} \right]$$

When it is reflected at a rigid support its amplitude becomes $\left(\frac{3}{4} \right)$ of its previous value. The equation of the reflected wave is

A. $0.8 \sin 4\pi \left[t + \frac{x}{5} \right]$

B. $0.6 \sin 4\pi \left[t + \frac{x}{5} \right]$

C. $0.6 \sin 4\pi \left[t - \frac{x}{5} \right]$

D. $-0.8 \sin 4\pi \left[t + \frac{x}{5} \right]$

Answer: B

Watch Video Solution

88. A progressive wave is described by the equation $y = 0.1\sin(100\pi t - 8\pi x)$, where x and y are in metre and t is in second. What is the velocity of an oscillating particle (P) of the medium, which is at a distance of $\frac{29}{24}$ m from the source point at time $t = 0.1s$?

A. $5\pi m/s$

B. $3\pi m/s$

C. $4\pi m/s$

D. $2\pi m/s$

Answer: A

Watch Video Solution

89. The equation of a progressive wave is given by $y = 5\cos(100t - 5x)$ where y is in microns, x in metre and t is in second. What is the ratio of the maximum particle velocity to the velocity of wave propagation?

A. 50×10^{-5}

B. 2.5×10^{-5}

C. 2.5×10^{-4}

D. 2.5×10^{-7}

Answer: B

Watch Video Solution

90. The transverse displacement $y(x, t)$ of a wave on a string is given by $y(x, t) = e^{-\left(ax^2 + bt^2 + 2\sqrt{(ab)}xt\right)}$. This represents a :

A. wave moving in $+x$ direction with speed $\sqrt{\frac{a}{b}}$

B. wave moving $-x$ direction with speed $\sqrt{\frac{b}{a}}$

C. standing wave of frequency $\sqrt{b}$

D. standing wave of frequency $\frac{1}{\sqrt{b}}$

Answer: B

Watch Video Solution

91. A transverse sinusoidal wave of amplitude A, wavelength λ and frequency f is travelling along a stretch string. The maximum speed of any point on the string is $\frac{v}{10}$, where, V is the velocity of wave propagation. If $A = 10^{-3}m,$ and $V = 10ms^{-1}$, then λ and f are given by

A. $\lambda = 2\pi \times 10^{-2}m, n = 10^{3}Hz$

B. $\lambda = 2\pi m, n\frac{10^3}{2\pi}Hz$

C. $\lambda = 2\pi \times 10^{-2}m$ and $n = \frac{10^3}{2\pi}Hz$

D. $\lambda = \pi \times 10^{-2}m$ and $n = 10^4 Hz$

Answer: C

Watch Video Solution

92. The equation of displacement of two waves are given as

$y_1 = 10\sin\left(3\pi t + \frac{\pi}{3}\right), y_2 = 5\left[\sin 3\pi t + \sqrt{3}\cos 3\pi t\right]$

Then what is the ratio of their amplitudes

A. $2:1$

B. $1:1$

C. $1:2$

D. None of these

Answer: B

Watch Video Solution

93. The equation of the progressive wave is y =a $\sin\pi\left(nt - \frac{x}{5}\right)$ the ratio maximum paritcle velocity to wave velocity is

A. $\frac{\pi a}{5}$

B. $\frac{2\pi a}{5}$

C. $\frac{3\pi a}{5}$

D. $\frac{4\pi a}{5}$

Answer: B

Watch Video Solution

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

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

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

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

Answer: C

Watch Video Solution

95. A harmonically moving transverse wave on a string has a maximum particle velocity and acceleration of 3 m/s and

$90m/s^2$ respectively. Velocity of the wave is $20m/s$. Find the waveform.

A. $y = 0.5\sin(20t + 1.5x)$

B. $y = 0.1\sin(30t + 1.5x)$

C. $y = 0.1\sin(40t + 2x)$

D. $y = 0.2\sin(30t + x)$

Answer: B

Watch Video Solution

96. 10 beats/ are produced by the superposition of two sound waves. If the equation of the first wave is $y_1 = 5\sin 20\pi(30t)$, then the equation of second wave is

A. $y_2 = 5\sin 20\pi(31t)$

B. $y_2 = 5\sin 20\pi(30t)$

C. $y_2 = 5\sin 20\pi(32t)$

D. $y_2 = 5\sin 21\pi(31t)$

Answer: A

Watch Video Solution

97. When a tuning fork and a source of frequency 200 Hz were sounded together, 4 beats were heard per second. When the tuning fork was loaded with some wax, again 4 bets were produced per second The original frequency of the tuning fork was

A. 200 Hz

B. 204 Hz

C. 196 Hz

D. 220 Hz

Answer: B

View Text Solution

98. A tuning fork of unknown frequency x, produces 5 beats per second with a tuning fork of frequency of 250 Hz. The produces 10 beats/second with another tuning fork frequency 265 Hz. The unknow frequency is

A. 245 Hz

B. 255 Hz

C. 275 Hz

D. 270 Hz

Answer: B

Watch Video Solution

99. The resultant wave produced due to superposition of two sound waves of equal amplitude (A) and nearly equal frequencies has a variable amplitude (R). The ratio of the maximum value of R to the amplitude of any one of the wave is

A. one

B. two

C. three

D. four

Answer: B

Watch Video Solution

100. A set of 31 tuning forks is arranged in series of decreasing frequency. Each fork gives 6 beats/sec. with the preceding one. The first fork is the octave of the last. The frequency of the last tuning fork is

A. 120 Hz

B. 150 Hz

C. 360 Hz

D. 180 Hz

Answer: D

Watch Video Solution

101. Two tuning forks of frequency 100 Hz and 106 Hz are sounded together. What is the time interval between a waxing and the nearest waning?

A. $\frac{1}{12}s$

B. $\frac{1}{6}s$

C. $\frac{1}{3}s$

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

Answer: A

View Text Solution

102. A tuning fork A produces 4 beats/second with another tuning fork of frequency 246 Hz. When the prongs of A are filed a

little, the number of beats heard is 6 per second. What is the original frequency of the fork A?

A. 242 Hz

B. 240 Hz

C. 250 Hz

D. 252 Hz

Answer: C

View Text Solution

103. Two tuning fork of frequency 100 Hz and 105 Hz are sounded together. The time interval between the successive waxing of sound will be

A. 0.1 second

B. 0.3 second

C. 1 second

D. 0.2 second

Answer: D

Watch Video Solution

104. 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. 18, 36

B. 9, 18

C. 72, 144

D. 36, 72

Answer: D

Watch Video Solution

105. 31 tuning forks are arranged in series in increasing order of frequencies and the frequency of the last tuning fork is 3 times the frequency of the first. If each tuning fork produces 4 beats/second with the preceding one, the frequency of the last tuning fork is

A. 30 Hz

B. 60 Hz

C. 90 Hz

D. 180 Hz

Answer: D

Watch Video Solution

106. Two sources of sound produce sound wave, which are given by $y_1 = 5 \sin 400\pi t$. A student receiving the wave simultaneously will hear

A. 3 beats/s

B. 4 beats/s

C. 10 beats/s

D. 6 beats/s

Answer: B

View Text Solution

107. If two waves having amplitudes 2 A and A and same frequency and velocity, propagate in the same direction in the same phase, the resulting amplitude will be

A. a

B. 3a

C. 0

D. $\sqrt{3}a$

Answer: B

Watch Video Solution

108. Three waves of equal frequency having amplitudes $10\mu m$, $4\mu m$, $7\mu m$ arrive at a given point with successive phase

difference of $\pi/2$, the amplitude of the resulting wave in μm is given by

A. $7\mu m$

B. $6\mu m$

C. $5\mu m$

D. $4\mu m$

Answer: C

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109. 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. 518 Hz

B. 516 Hz

C. 512 Hz

D. 508 Hz

Answer: B

Watch Video Solution

110. Two waves of wavelength 2m and 2.02 m respectively, moving with the same velocity superpose to produce 2 beats/second. The velocity of the waves is

A. 400 m/s

B. 402 m/s

C. 404 m/s

D. 406 m/s

Answer: C

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111. The frequency n_1, n_2 and n_3 of three tuning forks A, B, C are related as

$n_1 = 10.2n_2$ and $n_2 = 0.97n_2$

When A and C are sounded together, 5 beats/second are heard. What is the frequency of the fork A?

A. 100 Hz

B. 102 Hz

C. 110 Hz

D. 98 Hz

Answer: B

Watch Video Solution

112. Two tuning forks A and B produce notes of frequencies 250 Hz and 260 Hz respectively. When an unknown note is sounded with A it produces x beats/sec. But when the same note is sounded with B, the number of beats produced per second becomes 4x. The unknown frequency could be

A. 250 Hz

B. 252 Hz

C. 245 Hz

D. 270 Hz

Answer: B

Watch Video Solution

113. Two sound waves each of wavelength λ and having the same amplitude A form two sources S_1 and S_2 interfere at a point P. If the path difference $S_2P - S_1P = \frac{\lambda}{3}$, then the amplitude of the resultant were at P will be

A. A

B. 2A

C. A/2

D. 3A/2

Answer: A

Watch Video Solution

114. The speed of sound in a gas is 500 m/s. Two sound waves progressing simultaneously through this gas produce 5 beats/sec. If the wavelength of one of them is 2.5 m, then the wavelength of the other will be

A. 2.44 m

B. 2.56 m

C. either 2.44 m or 2.56 m

D. 3.5 m

Answer: C

Watch Video Solution

115. A tuning fork X produces 4 beats/sec with a tuning fork Y of frequency 384 Hz. When the prongs of X are slightly filed 3

beats/sec are heard. What is the original frequency of X ?

A. 388 Hz

B. 381 Hz

C. 380 Hz

D. 387 Hz

Answer: C

View Text Solution

116. 56 tuning forks are so arranged in series that each fork gives 4 beats per second with the previous one.The frequency of the last fork is three times that of the first.The frequency of the fork is

A. 55 Hz

B. 110 Hz

C. 75 Hz

D. 220 Hz

Answer: B

Watch Video Solution

117. Beats are produced when two sound waves given by $y_1 = A \sin 200\pi t$ and $y_2 = A \sin 210\pi t$ are sounded together. How many beats are produced/sec?

A. 3

B. 4

C. 5

D. 6

Answer: C

Watch Video Solution

118. Two tuning forks of frequencies $256Hz$ and $258Hz$ are sounded together. The time interval, between two consecutive maxima heard by an observer is

A. 2 second

B. 1 second

C. 0.5 second

D. 4 second

Answer: C

Watch Video Solution

119. Two tuning forks of frequency 320 Hz and 330 Hz, produce sound waves in air. What is the velocity of sound in air if the wavelengths of sound waves differ by 3.22 cm ?

A. 320 m/s

B. 340 m/s

C. 360 m/s

D. 310 m/s

Answer: B

Watch Video Solution

120. Two wires are producing fundamental notes of the same frequency. Change in which of the following factors of one wire will not produce beats between them

A. stretching force (Tension)

B. diameter of the wire

C. amplitude of vibrations

D. material of the wire

Answer: C

Watch Video Solution

121. A number of tuning forks are arranged in the order of increasing frequencies and any two successive tuning forks produce 4 beats/second, when sounded together. If the frequency of the last tuning fork is the octave of the first tuning fork and if the frequency of the first tuning fork is 256 Hz, then the number of tuning forks is

A. 46

B. 60

C. 65

D. 30

Answer: C

View Text Solution

122. The waves produced by two sources of sound are given by $y_1 = 10\sin(200\pi t)$ and $y_2 = 10\sin(210\pi t)$. If the waves superimpose, then the no. of beats heard by the listener in one minute will be

A. 100

B. 200

C. 300

D. 400

Answer: C

Watch Video Solution

123. Sound waves produced by two vibrators have the same wavelength in two different gases. The speed of the waves in the two gases are 420 m/s and 400 m/s. The vibrators, when sounded together produce 8 beats/second. The wavelength in the two gases will be

A. 1.25 cm

B. 2 m

C. 2.5 m

D. 3m

Answer: C

Watch Video Solution

124. A set of tuning forks is arranged in ascending order of frequency. Each tuning fork gives 5 beats per second with the preceding one. If the frequency of the first tuning fork is 100 Hz and that of last fork is 150 Hz, then the total number of tuning forks arranged are

A. 11

B. 9

C. 12

D. 10

Answer: A

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125. The frequecies of tuning forks A and B are respectively 5% more and 3% less than the frequency of tuning fork C. When A and B are sounded together 8 beats/second are heard. Then the frequency of the tuning fork B will be

A. 103 Hz

B. 100 Hz

C. 115 Hz

D. 97 Hz

Answer: D

Watch Video Solution

126. 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. $n - 2x$

D. $n + 2x$

Answer: B

Watch Video Solution

127. The frequency of fork A is 3% more than the frequency of a standard fork where as the frequency of fork B is 3% less. The fork A and B produce 6 beats per second. The frequency of standard fork will be -

A. 100 Hz

B. 103 Hz

C. 106 Hz

D. 112 Hz

Answer: A

Watch Video Solution

128. Two sources of light of intensities I and 4I emit light waves which interfere at a point. Intensity will be ..... At points where

the phase difference, is

A. 9I

B. 5I

C. 3I

D. I

Answer: B

Watch Video Solution

129. A tuning fork of frequency 480 Hz produces 10 beats per second when sounded with a vibrating sonometer string. What must have been the frequency of the string if a slight increase in tension produces lesser beats per second than before

A. 480 Hz

B. 490 Hz

C. 470 Hz

D. 460 Hz

Answer: C

Watch Video Solution

130. There is a destructive interference between the two waves of wavelength λ coming from two different paths at a point. To get maximum sound or constructive interference at that point, the path of one wave is to be increased by

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

B. λ

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

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

Answer: A

Watch Video Solution

131. The superposing waves are represented by the following equations :

$y_1 5 \sin 2\pi(10t - 0.1x), y_2 = 10 \sin 2\pi(20t - 0.2x)$ Ratio of intensities $\frac{I_{\max}}{I_{\min}}$ will be

A. 4

B. 9

C. 16

D. 1

Answer: B

Watch Video Solution

132. 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. $2A\cos\theta$

B. $1.2f, 1.2\lambda$

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

D. $2A\cos\frac{\theta}{2}$

Answer: D

Watch Video Solution

133. Two sound waves are given by $y_1 = A\sin(1000\pi t)$ and $y_2 = A\sin(1008\pi t)$. The number of beast heard per second is

A. 8

B. 4

C. 0

D. 2

Answer: B

Watch Video Solution

134. A tuning fork when sounded along with a standard source of frequency 300 Hz produces 5 beats s^{-1}. The tuning fork when

loaded by some wax is again found to give 5 beat s^{-1} with the standard source. The original frequency of the fork is

A. 290 Hz

B. 295 Hz

C. 305 Hz

D. 310 Hz

Answer: C

View Text Solution

135. Two tuning forks of frequencies 100 Hz and 95 Hz are sounded together. The time interval between two consecutive minima in the resultant sound is

A. 0.1 sec

B. 0.15 sec

C. 0.2 sec

D. 0.25 sec

Answer: C

Watch Video Solution

136. A set of 20 tuning fork is arranged in a series of increasing frequencies. Each tuning fork gives 4 beats per second with the preceding one. How many beats per second are produced between consective odd number tuning forks?

A. 4

B. 6

C. 8

D. 12

Answer: C

View Text Solution

137. For two sound waves $\lambda_1 = 100cm$, $\lambda_2 = 110cm$ and velocity of sound is 330 m/s. When λ_1 and λ_2 super impose, the number of beats produced per second is

A. 10

B. 20

C. 30

D. 45

Answer: C

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138. 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. 294

B. 288

C. 286

D. 292

Answer: D

Watch Video Solution

139. Tuning fork A of frequency 205 Hz produces 5 beats/sec with another fork B. After filing the tuning fork B, it produces 3 beats/sec with A. What was the frequency of the fork B before filling?

A. 310 Hz

B. 313 Hz

C. 308 Hz

D. 300 Hz

Answer: D

Watch Video Solution

140. In the production of beats by two waves of same amplitude and nearly same frequency, the maximum intensity to each of

the constituent waves is

A. 1

B. 2

C. 4

D. 8

Answer: C

Watch Video Solution

141. Two tuning forks A and B give 4 beats/s when sounded together. If the fork B is loaded with wax 6 beats/s are heard. If the frequency of fork A is 320 Hz, then the natural frequency of the tuning fork B will be

A. 316 Hz

B. 326 Hz

C. 314 Hz

D. 320 Hz

Answer: A

Watch Video Solution

142. Two waves are represented by $y_1 = a\sin\left(\omega t + \frac{\pi}{6}\right)$ and $y_2 = a\cos\omega t$. What will be their resultant amplitude

A. $\sqrt{3}A$

B. $\sqrt{2}A$

C. 2A

D. A

Answer: A

Watch Video Solution

143. Two waves having equaitons

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

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

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

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

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

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

Answer: A

Watch Video Solution

144. 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 ferquency of the source?

A. 105 Hz

B. 205 Hz

C. 95 Hz

D. 100 Hz

Answer: A

Watch Video Solution

145. The wavelength of two waves are 50 and 51 cm respectively. The temperature of the room is $20^{\circ} C$. What will be the number of beats produced per second by these waves, if the speed of sound at $0^{\circ} C$ is 332 m/sec?

A. 10

B. 14

C. 24

D. None of these

Answer: B

Watch Video Solution

146. 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. $a\sqrt{3}$

B. $a\sqrt{2}$

C. a

D. 2a

Answer: C

Watch Video Solution

147. When two progressive waves $y_1 = 4\sin(2x - 6t)$ and $y_2 = 3\sin\left(2x - 6t - \frac{\pi}{2}\right)$ are superimposed, the amplitude of the resultant wave is

A. 4 units

B. 5 units

C. 8 units

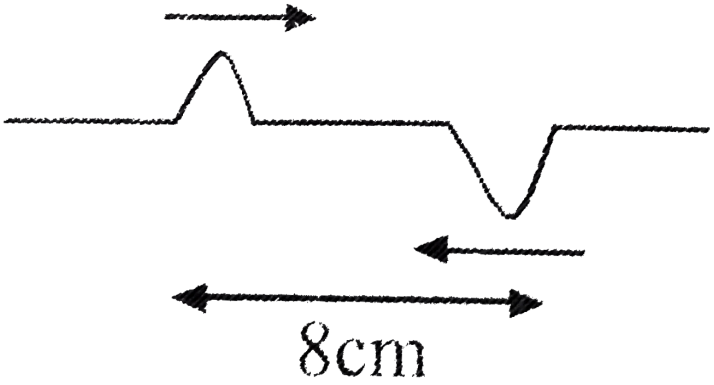
D. 10 units

Answer: B

Watch Video Solution

148. Two pulses in a stretched string whose centres are initially 8 cm apart are moving towards each other as shown in the figure. The speed of each pulse is 2 cm/s. After 2 second, the total

energy of the pulses will be



A. purely potential

B. partly kinetic and partly potential

C. zero

D. purely kinetic

Answer: D

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149. Two plane harmonic sound waves are expressed by the equations.

$y_1(x,t) - A\cos(0.5\pi x - 100\pi t), y_2(x,t) = A\cos(0.46\pi x - 92\pi t)$

(All parameters are in MKS) :

At x=0 how many times the amplitude of $y_1 + y_2$ is zero in one second :-

A. 8

B. 6

C. 4

D. 3

Answer: C

Watch Video Solution

150. Two plane harmonic sound waves are expressed by the equations.

$y_1(x,t) - A\cos(0.5\pi x - 100\pi t), y_2(x,t) = A\cos(0.46\pi x - 92\pi t)$

(All parameters are in MKS) :

At x=0 how many times the amplitude of $y_1 + y_2$ is zero in one second :-

A. 100

B. 92

C. 8

D. 4

Answer: A

Watch Video Solution

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

A. half the speed of sound

B. equal to the speed of sound

C. double the speed of sound

D. thrice the speed of sound

Answer: B

Watch Video Solution

152. Find the 'wrong' statement form the following: Doppler effect will not be observed if

A. both the source and the observer are stationary

B. the relative velocity between the source and the observer is zero

C. the source or the observer are moving at supersonic speeds

D. the speeds of the source and the sound are different but they are less than the speed of sound

Answer: c

Watch Video Solution

153. Find the wrong statement from the following:

The relative speed between a source of sound and the observer

is zero but the wind is blowing with a velocity V_w from the source to the obsever. In this case

A. there is no change in the frequency of the sound heard

B. the velocity of sound is increased from $V + V_w$

C. the wavelength of sound heard is decreased

D. the wavelength of sound heard is increased

Answer: C

View Text Solution

154. Two sources of sound A and B kept at a certain distance produce sound waves of the same frequency (n). An observer starts running from A and goes towards B. Then during his journey from A to B

A. he will hear sound notes of the same frequency

B. the sound received from A will be always of a frequency which is higher than n

C. the sound received from B will be always of the frequency which is lower than n

D. he will hear beats if the different in apparent frequencies is small

Answer: D

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155. when a source is going away from a stationary observer with the velocity equal to that of sound in air , then the frequency

heard by observer is n times the original frequency . The value of n is

A. same

B. half

C. double

D. one third

Answer: B

Watch Video Solution

156. A siren emitting a note of frequency n is fitted on a police van, travelling towards a stationary listener. What is the velocity of the van, if the frequency of the note heard by the listener is double the original frequency?

A. $V_S = V$

B. $V_S = \frac{V}{2}$

C. $V_S = 2V$

D. $V_S = \frac{V}{3}$

Answer: B

Watch Video Solution

157. The driver of a car travelling with a speed of 30 m/s towards a wall sounds a siren of frequency 500 Hz. If the velocity of sound in air is 330 m/s, then the frequency of the sound reflected from the wall and as heard by the driver is

A. 550 Hz

B. 600 Hz

C. 650 Hz

D. 450 Hz

Answer: B

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158. Two aeroplanes A and B are moving towards each other with a speed of 120 m/s. The frequency of the shistle emitted by A is 100 Hz. What is the apparent frequency of the whistle as heard by the captain of plane B?

(Velocity of sound in air = 360 m/s)

A. 500 Hz

B. 1500 Hz

C. 2000 Hz

D. 2500 Hz

Answer: C

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159. Is Doppler effect applicable only to sound waves.

A. sound waves

B. micro waves

C. matter waves

D. electromagnetic waves

Answer: C

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160. A sound source is moving towards a stationary observer with 1/10 of the speed of sound. The ratio of apparent to real frequency is

A. $\frac{9}{10}$

B. $\frac{10}{9}$

C. $\left(\frac{10}{11}\right)^2$

D. $\left(\frac{9}{10}\right)^2$

Answer: B

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161. An engine is moving on a circular path of radius 200 m with a speed of 15 m/s. What will be the frequency observed by an

observer standing at rest, at the centre of the circular path, when the engine blows a whistle of frequency 250 Hz?

A. more than 250 Hz

B. less than 250 Hz

C. equal to 250 Hz

D. 500 Hz or zer

Answer: C

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

A. $18:19$

B. $19:18$

C. $1:2$

D. $2:1$

Answer: B

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163. A vehicle, with a horn of frequency n is moving with a velocity of 30 m/s in a direction perpendicular to the straight line joining the observer and the vehicle. The observer perceives the sound to have a frequency $n + n_1$. Then (if the sound velocity in air is 300 m/s)

A. $n_1 = 10n$

B. $n_1 = 0$

C. $n_1 = 0.1n$

D. $n_1 = -0.1n$

Answer: B

Watch Video Solution

164. A blowing whistle is performing a uniform circular motion in a horizontal circle of radius r. An observer standing outside the circular parth,

A. will hear a sound of uniform pitch

B. will not hear any sound

C. will hear a sound of frequency which is once more and once less than the acutal frequency in one revolution of

the whistle

D. will hear a sound of frequency which is twice maximum and twice minimum in one round of the whistle

Answer: C

Watch Video Solution

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

A. 500 Hz

B. 450 Hz

C. 550 Hz

D. 395 Hz

Answer: A

Watch Video Solution

166. The Pitch of the whistle of an engine appears to drop to $\frac{5}{6}$ th of original value when it passes a stationary observer if the speed of sound in air is 350 m/s then the speed of engine is

A. 35 m/s

B. 70 m/s

C. 105 m/s

D. 140 m/s

Answer: B

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167. A source is moving towards an observer with a speed of 20 m / s and having frequency of 240 Hz . The observer is now moving towards the source with a speed of 20 m / s . Apparent frequency heard by observer, if velocity of sound is 340 m / s , is

A. 240 Hz

B. 270 Hz

C. 360 Hz

D. 268 Hz

Answer: B

Watch Video Solution

168. Two sound sources emitting sound each of wavelength λ are fixed at a given distance apart. A listener moves with a velocity u

along the line joining the two suorces. The number of beats heard by him per second is

A. $\frac{2u}{\lambda}$

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

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

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

Answer: A

Watch Video Solution

169. A train moves towards a stationary observer with a speed of 40 m/s. The observer records the frequency of the train's whistle as f_1. But when the train's speed is reduced to 20 m/s, the frequency of the whistle recored by him is f_2. What is the ratio $\frac{f_1}{f_2}$, if the speed of sound in air is 340 m/s ?

A. $\frac{17}{16}$

B. $\frac{16}{15}$

C. $\frac{15}{14}$

D. $\frac{15}{16}$

Answer: B

Watch Video Solution

170. Two whistles Aand B produces notes of frequencies 660 Hz and 596 Hz respectively. There is a listener at the mid- point of the line joining them. Now the whistle B and the listener start moving with speed 30 m/s away from the whistle A. If speed of sound be 330 m/s, how many beats will be heard by the listener

A. 2

B. 3

C. 4

D. 5

Answer: C

Watch Video Solution

171. Consider the droppler effect in two cases. In the first case an observer moves towards a stationary sound-source, with a speed V_1. In the second case, the observer is at rest, and the source moves towards the observer with the same speed V_1. Then the frequency heard by the observer

A. will be the same in both cases

B. will be more in the second case than in the first case

C. will be less in the second case than in the first case

D. will be less than the actual frequency in both cases

Answer: B

Watch Video Solution

172. A whistle producing sound waves of frequencies $9500Hz$ and above is approaching a stationary person with speed vms^{-1}. The velocity of sound in air is $300ms^{-1}$. If the person can hear frequencies upto a maximum of $10,000Hz$.The maximum value of v upto which he can hear whistle is

A. $15ms^{-1}$

B. $30ms^{-1}$

C. $15\sqrt{2}ms^{-1}$

D. $\frac{15}{\sqrt{2}} ms^{-1}$

Answer: A

Watch Video Solution

173. A motor cycle starts from rest and accelerates along a straight path at $2m/s^2$. At the starting point of the motor cycle there is a stationary electric siren. How far has the motor cycle gone when the driver hears the frequency of the siren at 94% of its value when the motor cycle was at rest ? (Speed of sound = $330ms^{-2}$)

A. 49 m

B. 98 m

C. 147 m

D. 196 m

Answer: B

Watch Video Solution

174. A source of sound of frequency 256 Hz is moving towards a wall with a velocity of 5 m/s. How many beats per second will be heard by an observer O standing in such a positoin that the source S is between O and wall? $\left(c = 330\frac{m}{s}\right)$

A. 8

B. 6

C. 10

D. 4

Answer: A

Watch Video Solution

175. 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. 6

B. 8

C. 10

D. 4

Answer: B

Watch Video Solution

176. A car sounding a horn of frequency 1000 Hz passes an observer. The ratio of frequencies of the horn noted by the observer before and after passing of the car is 11 : 9. If the speed of sound is v , the speed of the car is

A. v

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

C. $\frac{1}{10}v$

D. $\frac{1}{5}v$

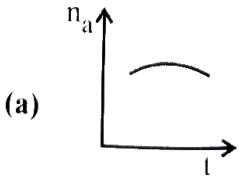
Answer: C

Watch Video Solution

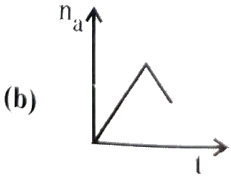
177. A train whistling at constant frequency is moving towards a station at a constant speed V. The train goes past a stationary

observer on the station. The frequency n' of the sound as heard by the observer is plotted as a function of time t, figure. Identify the expected curve.

A.



B.



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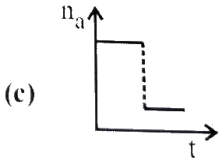
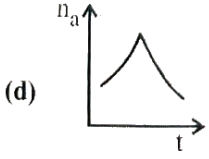


D.



Answer: C

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178. When a longistudinal wave is incident at the bondary of a denser medium, then

A. compression gets reflected as a compression

B. compression gets reflected as a rarefraction

C. rarefraction gets reflected as a compression

D. longitudinal wave reflects as transverse wave

Answer: A

Watch Video Solution

179. Let n_1 and n_2 be the two slightly different frequencies of two sound waves. The time interval between a waxing and the immediate next waning is

A. $\frac{1}{n_1 - n_2}$

B. $\frac{2}{n_1 - n_2}$

C. $\frac{n_1 n_2}{2}$

D. $\frac{1}{2(n_1 - n_2)}$

Answer: D

Watch Video Solution

180. The apparent frequency of the sound, heard by a listener is less than the actual frequency of sound emitted by a source. In ths case

A. the listener moves towards the source

B. the source moves towards the listener

C. the listener moves away from the source

D. the source and listener move towards each other

Answer: C

Watch Video Solution

181. A wave is reflected from a rigid support. The change in phase on reflection will be

A. zero rad

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

C. $\frac{3\pi}{4}$ rad

D. π rad

Answer: A

Watch Video Solution

182. Let velocity of a sound wave be 'v' and $'\omega'$ be angular velocity. The propagation constant of the wave is

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

B. $\sqrt{\frac{v}{\omega}}$

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

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

Answer: C

Watch Video Solution

183. The change in phase if a wave is reflected from a rigid surface is

A. 0 rad

B. $\frac{\pi}{4}$ rad

C. $\frac{\pi}{2}$ rad

D. π rad

Answer: D

Watch Video Solution

184. When the observer moves towards the stationary source with velocity, v_1, the apparent frequency of emitted note is f_1. When the observer moves away from the source with velocity v_1, the apparent frequency is f_2. If v is the velocity of sound in air and $\frac{f_1}{f_2} = 2$,then $\frac{v}{v_1} = ?$

A. 2

B. 3

C. 4

D. 5

Answer: B

Watch Video Solution

185. A progressive wave is represented by $y = 12\sin(5t - 4x)$ cm. On this wave, how far away are the two points having phase difference of 90° ?

A. $\frac{\pi}{2}cm$

B. $\frac{\pi}{4}cm$

C. $\frac{\pi}{8}cm$

D. $\frac{\pi}{16}cm$

Answer: C

Watch Video Solution

186. The equation of the progressive wave is $y = 3\sin\left[\pi\left(\frac{t}{3} - \frac{x}{5}\right) + \frac{\pi}{4}\right]$, where x and y are in metre and time in second. Which of the following is correct.

A. Velocity v = 1.5 m/s

B. Amplitude A = 3 cm

C. Frequency F = 0.2 Hz

D. Wavelength $\lambda = 10cm$

Answer: D

Watch Video Solution

187. The observer is moving with velocity $'v'_0$ towards the stationary source of sound and then after crossing moves away from the source with velocity $'v'_0$. Assume that the medium through which the sound waves travel is at rest. If v is the velocity of sound and n is the frequency emitted by the source, then the difference between appearent frequencies heard by the observer is

A. $\frac{2nv_0}{v}$

B. $\frac{nv_0}{v}$

C. $\frac{v}{2nv_0}$

D. $\frac{v}{nv_0}$

Answer: A

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Test Your Grasp

1. In a sinusoidal wave, the time required by a particular particle to move from maximum displacement to zero displacement is 0.025 sec. The frequency of the wave is

A. 2.5 Hz

B. 5 Hz

C. 7.5 Hz

D. 10 Hz

Answer: D

Watch Video Solution

2. A longitudinal wave in air is travelling towards the closed base of measuring cylinder. IF a compression reach the bottom, it will be reflected back as

A. a compression

B. a rarefaction

C. a rarefaction or a compression depending upon the height and radius of the cylinder

D. compression or rarefaction depending upon the velocity of the incident wave

Answer: A

Watch Video Solution

3. If the amplitude of a wave at a distance r from a point source is A, the amplitude at a distance $2r$ will be

A. 2A

B. A

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

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

Answer: C

Watch Video Solution

4. The equation of a progressive wave is given by

$$y = 5\sin\left[\pi\left(\frac{t}{5} - \frac{x}{10}\right)\right] + \frac{\pi}{6}m$$

Then which one of the following is correct?

A. a = 10 m

B. $\lambda = 20m$

C. $T = 5s$

D. n = 5 Hz

Answer: B

Watch Video Solution

5. A simple harmonic wave is represent by the relation

$$y(x, t) = a_0 \sin 2\pi\left(vt - \frac{x}{\lambda}\right)$$

if the maximum particle velocity is three times the wave velocity, the wavelength λ of the wave is

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

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

C. $\frac{3}{2\pi A}$

D. $\frac{\pi A}{2}$

Answer: A

Watch Video Solution

6. Two waves of equal amplitude when superposed, give a resultant wave having an amplitude equal to that of either wave. The phase difference between the two waves is

A. $\frac{\pi}{2}$ radian

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

C. $\frac{3\pi}{4}$ radian

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

Answer: B

Watch Video Solution

7. A set of 11 tuning forks is arranged in the ascending order of frequencies. Each tuning fork gives 4 beats/second with the preceding one. If the frequency of the last fork is twice that of the first, then the frequency of the 5th tuning fork is

A. 28 Hz

B. 40 Hz

C. 56 Hz

D. 80 Hz

Answer: C

View Text Solution

8. An unknown frequency x produces 8 beats per seconds with a freuquency of 250 Hz and 12 beats with $270Hz$. Source then x is

A. 242 Hz

B. 258 Hz

C. 282 Hz

D. 262 Hz

Answer: B

Watch Video Solution

9. Two sound waves of wavelength $\frac{92}{147}m$ and $\frac{92}{149}m$ produce 8 beats per second, when allowed to surperimpose/ The velocity of sound is

A. 368 m/s

B. 320 m/s

C. 312 m/s

D. 332 m/s

Answer: A

Watch Video Solution

10. Wavelengths of two sound notes in air are $\frac{80}{177}$m and $\frac{80}{175}m$ respectively. Each note of a fixed frequency. What is the velocity of sound in air?

A. 300 m/s

B. 320 m/s

C. 310 m/s

D. 350 m/s

Answer: B

Watch Video Solution

11. 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. 394 Hz

B. 385 Hz

C. 374 Hz

D. 333 Hz

Answer: C

Watch Video Solution

12. 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. 0.05

B. 0.1

C. 0.2

D. 0.25

Answer: C

Watch Video Solution

13. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u so that he hears 10 beats per second?

A. 3.5 m/s

B. 3 m/s

C. 2 m/s

D. 2.5 m/s

Answer: D

Watch Video Solution

14. A man is watching two trains, one leaving and the other coming in with equal speed of 4 m/s. If they sound their whistles,

each of frequency 240 Hz, the number of beats heard by the man (velocity of sound in air is $320\frac{m}{s}$) will be equal to

A. 3

B. 4

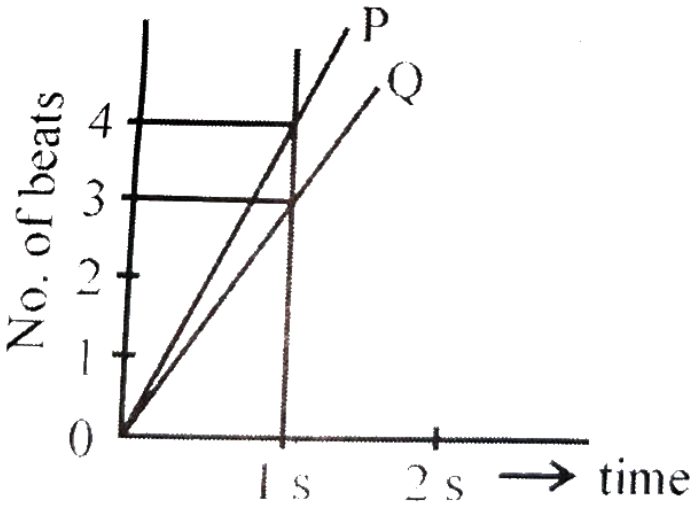
C. 5

D. 6

Answer: D

Watch Video Solution

15. A tuning fork A having a frequency of 300 Hz is sounded together with a tuning fork B. The graph of number of beats against time is as shown by the line OP in the figure



B is now loaded with a little wax, and again A and B are sounded together. The beats produced are shown by the line OQ. The frequency of the fork Q before loading is

A. 296 Hz

B. 300 Hz

C. 304 Hz

D. 302 Hz

Answer: C

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