PHYSICS

BOOKS - MTG GUIDE PHYSICS (HINGLISH)

OSCILLATIONS AND WAVES

Illustration

1. A particle executes SHM of period 1.2 s and amplitude 8 cm. find the time it takes to travel 3 cm the positive extremity of its oscillation. Given $\cos^{-1}(0.625) = 51^{\circ}$.

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2. Two simple harmonic motion of angular frequency 100 and $1000 rad s^{-1}$ have the same displacement amplitude The ratio of their maximum acceleration is

A. $1 : 10^3$

B. $1 : 10^4$

C. $1 : 10$

D. $1 : 10^2$

Answer: D

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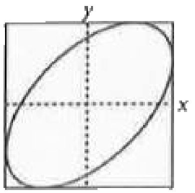
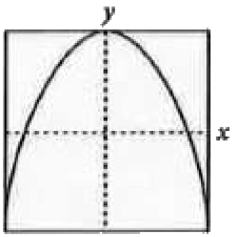
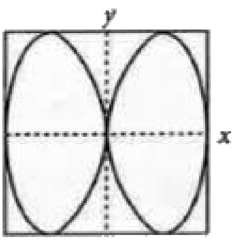
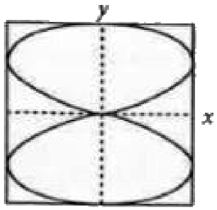
3. x and y displacements of a particle are given as $x(t) = -a \sin \omega t$ and $y(t) = a \sin 2\omega t$. Its trajectory will look like.

A. 

B. 

C. 



D.

Answer: C

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4. A mass (M) is suspended from a spring of negligible mass. The spring is pulled a little and then released so that the mass executes SHM of time period T. If the mass is increased by m, the time period becomes $\frac{5T}{3}$. Then the ratio of $\frac{m}{M}$ is .

A. $3/5$

B. $25/9$

C. $16/9$

D. $5/3$

Answer: C

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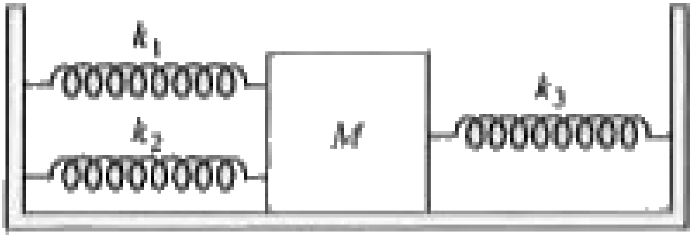
5. At equilibrium, the springs are released, mass M is oscillating under the influence of three springs, k_1, k_2 and k_3 as shown. Its frequency (v) of oscillation is $\frac{1}{2\pi}\sqrt{\frac{k_{eq}}{M}}$, where k_{eq} I such that



A. $k_{eq} = k_1 + k_2 + k_3$

B. $k_{eq} = \frac{k_1 + k_2 + k_3}{3}$

C. $\frac{1}{k_{eq}} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3}$

D. $k_{eq} = (k_1 + k_2 - k_3)$

Answer: A

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6. Two bodies A and B of equal mass are suspended from two separate massless springs of spring constant k_1 and k_2 respectively. If the bodies iscillte vertically such that their maxixum velocities are equal, the ratio of the amplitude of A to that of B is

A. $\sqrt{\frac{k_1}{k_2}}$

B. $\sqrt{\frac{k_2}{k_1}}$

C. $\frac{k_1}{k_2}$

D. $\frac{k_2}{k_1}$

Answer: B

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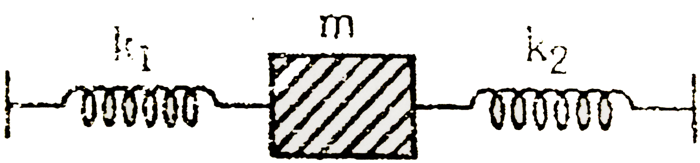
7. Two springs of force constants k_1 and k_2, are connected to a mass m as shown. The frequency of oscillation of the mass is f. If both k_1 and k_2 are made four times their original values, the frequency of oscillation becomes



A. $2v$

B. $v/2$

C. $v/4$

D. $4v$

Answer: A

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8. If E_P and E_K represent the potential energy and kinetic energy of a body undergoing S.H.M, then (E is the total energy of the body), at a position where the displacement is half the amplitude.

A. $E_P = \frac{E}{2}, E_K = \frac{E}{2}$

B. $E_P = \frac{3E}{4}, E_K = \frac{E}{4}$

C. $E_P = \frac{E}{4}, E_K = \frac{3E}{4}$

D. $E_P = \frac{E}{3}, E_K = \frac{2E}{3}$

Answer: C

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9. The total mechanical energy of a spring mass system in simple harmonic motion is $E = \frac{1}{2} m\omega^2 A^2$. Suppose the oscillating particle is replaced by another particle of double the mass while the amplitude A remains the same. The new mechanical energy will

A. become 2E

B. become $E/2$

C. become $\sqrt{2}E$

D. remain E

Answer: D

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10. Starting from the origin a body osillates simple harmonicall with a period of 2 s. A fter what time will its kinetic energy be 75% of the total energy?

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

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

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

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

Answer: B

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11. A simple pendulum is set up on a trolley which slides down a frictionless inclined plane making an angle θ with horizontal. The time period of pendulum is

A. $2\pi\sqrt{\frac{l}{g}}$

B. $2\pi\sqrt{\frac{l\cos thta}{g}}$

C. $2\pi\sqrt{\frac{l}{g\cos\theta}}$

D. $2\pi\sqrt{\frac{l}{g(1-\cos\theta)}}$

Answer: C

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12. A simple pendulum is suspended from the roof of a trolley which moves in a horizontal direction with an acceleration α, then the time period is given by $T = 2\pi\sqrt{\left(\frac{I}{T}\right)}$ where g is equal to

A. g

B. $g - a$

C. $g + a$

D. $\sqrt{g^2 + a^2}$

Answer: D

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13. A simple pendulum of length l_1 has a time period of 4 s and another simple pendulum of length l_2 has a time period 3 s. Then the time period of another pendulum of length $(l_1 - l_2)$ is

A. $\sqrt{3}s$

B. $1s$

C. $\sqrt{\frac{3}{4}}s$

D. $\sqrt{7}s$

Answer: D

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14. The displacement of a particle of a string carrying a travelling wave is given by $y = (4cm)\sin 2\pi(0.5x - 100t)$, where x is in cm and t is in seconds. The speed of the wave is

A. 50 cm/s

B. 100 cm/s

C. 200 cm/s

D. 250 cm/s

Answer: C

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15. The displacement of a wave disturbance propagating in the positive x-direction is given by

$y = \frac{1}{1 + x^2}$ at $t = 0$ and $y = \frac{1}{1 + (x - 1)^2}$ at $t = 2s$

where, x and y are in meter. The shape of the wave disturbance does not change during the propagation. what is the velocity of the wave?

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16. The disperod of a particle varies according to the relation $x = 4(\cos \pi t + \sin \pi t)$. The amplitude of the particle is.

A. -4

B. 4

C. $4\sqrt{2}$

D. 8

Answer: C

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17. The displacement of a particle executing S.H.M. is given by $y = 10\sin\left[6t + \frac{\pi}{3}\right]$ where y is in metres and t is in seconds. Then the initial displacement and velocity of the particle is

A. $5\sqrt{3}m$ and $30ms^{-1}$

B. $20\sqrt{3}m$ and $30ms^{-1}$

C. $15\sqrt{3}m$ and $30ms^{-1}$

D. $15m$ and $5\sqrt{3}ms^{-1}$

Answer: A

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18. A traverse wave is repersented by the equation

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

For what value of λ the maximumn particle velocity equal to two times the wave velocity

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19. A uniform rope of length 10 m and mass 3 kg hangs vertically from a rigid support. A block of mass 1 kg is attached to the free end of the rople. A transverse pulse of wavelength 0.05 m is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is

A. 0.10 m

B. 0.12 m

C. 0.16 m

D. 0.18 m

Answer: A

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20. The vibrations of a string fixed at both ends are described by the equation $y = (5.00mm)\sin\left[\left(1.57cm^{-1}\right)x\right]\sin\left[\left(314s^{-1}\right)t\right]$

(a) What is the maximum displacement of particle at x = 5.66 cm ? (b) What are the wavelengths and the wave speeds of the two transvers waves that combine to give the above vibration ? (c) What is the velocity of the particle at x = 5.66 cm at time t = 2.00s ? (d) If the length of the string is 10.0 cm, locate the nodes and teh antinodes. How many loops are formed in the vibration ?

A. 2

B. 3

C. 4

D. 5

Answer: D

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21. A sonometer wire resonates with a given tuning fork forming a standing wave with five antinodes between the two bridges when a mass of $9kg$ is suspended from the wire. When this mass is replaced by a mass 'M' kg, the wire resonates with the same tuning fork forming three antinodes for the same positions of the bridges. Find the value of M.

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22. The equation of a stationary wave is given by $y = 6\sin.\frac{2\pi x}{3}\cos 40\pi t$. Where y and x are in cm and time t is in s. In respect to the component progressive waves, calculate

(a) amplitude (b) wavelength (c) frequency

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23. An open organ pipe has a length of 5 cm. (a) Find the fundamental frequency of vibration of this pipe. (b) What is the highest harmonic of such a tube that is in the audible range ? Speed of sound in air is $340ms^{-1}$ and the audible range is 20-20,000 Hz.

A. 4

B. 5

C. 6

D. 7

Answer: B

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24. 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

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25. 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) $\frac{4l}{3}\sqrt{\frac{\rho_2}{\rho_1}}$

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26. A source of sound of frequency 512 Hz is moving towards a huge reflector-wll, with a velocity of 10 m/s. Velocity of sound in air = 330 m/s. How many beats per second will be heard by an observer standing between the source and the wall?

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27. 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. 4

B. 3

C. 2

D. 1

Answer: D

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28. A tuning fork arrangement (pair) produces 4beats/with one fork of frequency 288 c.p.s. A little wax is placed on the unknown fork and it then produces 2 beats/s. The frequency of the unknown fork is

A. 286 cps

B. 292 cps

C. 294 cps

D. 288 cps

Answer: b

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29. A vibrating tuning fork tied to the end of a string 1.988 m long is whirled round a circle. If it makes two revolutions in a second, calculate the ratio of the frequencies of the highest and the lowest notes heard by an observer situated in the plane of the tuning fork. Valocity of sound is 350 m/s.

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30. How many times more intense is 20 dB sound compared to 10 dB sound?

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31. 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

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32. 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

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Neet Cafe Topicwise Practice Questions

1. if the frequency of human heart is 1.25 Hz, the number of heart beats in 1 minutes is

A. 80

B. 65

C. 90

D. 75

Answer: A

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2. The velocity of a particle executing simple harmonic motion is

A. $\omega^2\sqrt{A^2+x^2}$

B. $\omega\sqrt{A^2-x^2}$

C. $\omega\sqrt{A^2+x^2}$

D. $\omega^2\sqrt{A^2 - x^2}$

Answer: B

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3. The maximum speed of a particle executing SHM is 10 m/s and maximum acceleration is $31.4m/s^2$. Its periodic time is

A. 2 s

B. 4 s

C. 6 s

D. 1 s

Answer: C

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4. If the displacement (x) and velocity (v) of a particle executing simple harmonic motion are related through the expression $4v^2 = 25 - x^2$, then its time period is given by

A. π

B. 2π

C. 4π

D. 6π

Answer: B

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5. A particle executing of a simple harmonic motion covers a distance equal to half its amplitude in on e second . Then the time period of the simple harmonic motion is

A. 4 s

B. 6 s

C. 8 s

D. 12 s

Answer: C

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6. A particle makes simple harmonic motion in a straight line 4 cm long. Its velocity while passing through the centre of the line is $16cms^{-1}$. The period of the oscillation is

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

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

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

D. $\frac{\pi}{8}s$

Answer: B

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7. A simple harmonic oscillation has an amplitude A and time period T. The time required to travel from $x = A$ to $x = \frac{A}{2}$ is

A. $T/6$

B. $T/4$

C. $T/3$

D. $T/2$

Answer: B

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8. Time period of a particle executing SHM is 8 sec. At $t = 0$ it is at the mean position. The ratio of the distance covered by the particle in the $1st$ second to the $2nd$ second is:

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

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

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

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

Answer: A

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9. A particle executes linear simple harmonic motion with an amplitude of 2 cm . When the particle is at 1 cm from the mean position the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is

A. $\frac{1}{2\pi\sqrt{3}}$

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

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

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

Answer: C

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10. A point mass oscillates along the $x-$ acis according to the law $x = x_0 \cos(\omega t - \pi/4)$ if the acceleration of the particle is written as, a $= A \cos(\omega + \delta)$, then :

A. $A = x_0\omega^2, \delta = 3\pi/4$

B. $A = x_0, \delta = -\pi/4$

C. $A = x_0\omega^2, \delta = \pi/4$

D. $A = x_0\omega^2, \delta = -\pi/4$

Answer: B

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11. The maximum velocity a particle, executing simple harmonic motion with an amplitude 7 mm, 4.4 m//s. The period of oscillation is.

A. 100 s

B. 0.01 s

C. 10 s

D. 0.1 s

Answer: A

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12. The displacement of a particle executing S.H.M. is given by y = 0.25 sin 200t cm. The maximum speed of the particle is

A. $200 cm s^{-1}$

B. $100 cm s^{-1}$

C. $50 cm s^{-1}$

D. $5.25 cm s^{-1}$

Answer: C

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13. The potential energy of a particle of mass $1kg$ in motion along the x- axis is given by: $U = 4(1 - \cos 2x)$, where x in meters. The period of small oscillation (in sec) is

A. 2π

B. π

C. $\pi / 2$

D. $\sqrt{2}\pi$

Answer: B

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14. A particle executing harmonic motion is having velocities v_1 and v_2 at distances is x_1 and x_2 from the equilibrium position. The amplitude of the motion is

A. $\sqrt{\dfrac{v_1^2x_2^2 - v_2^2x_1^2}{v_1^2 + v_2^2}}$

B. $\sqrt{\dfrac{v_1^2x_2^2 - v_2^2x_2^2}{v_1^2 + v_2^2}}$

C. $\sqrt{\dfrac{v_1^2x_2^2 - v_2^2x_1^2}{v_1^2 - v_2^2}}$

D. $\sqrt{\dfrac{v_1^2x_2^2 - v_2^2x_1^2}{v_1^2 + v_2^2}}$

Answer: B

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15. A particle of mass (m) is executing oscillations about the origin on the (x) axis. Its potential energy is $V(x) = k|x|^3$ where (k) is a positive constant. If the amplitude of oscillation is a, then its time period (T) is.

A. proportional to $1/\sqrt{A}$

B. proportional to A

C. proportional to $\sqrt{A}$

D. proportional to $A^{3/2}$

Answer: C

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16. The displacement of a particle from its mean position (in metre) is given by

$$y = 0.2\sin(10\pi t + 1.5\pi)\cos(10\pi t + 1.5\pi)$$

The motion of the particle is

A. periodic but not simple harmonic motion

B. non periodic

C. simple harmonic motion with period of 0.1 s

D. simple harmonic motion with period of 0.2 s

Answer: C

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17. A particle is executing simple harmonic motion of amplitude 5 cm and period 6 s. How long will it take to move from one end of its path on one side of mean position to a position 2.5 cm on the same side of the mean position ?

A. 1 s

B. 1.5 s

C. 3 s

D. 3.5 s

Answer: A

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18. Which of the following relationship between the acceleration, a and the displacement x of a particle involve simple harmonic motion.

(a) $a = 7.0x$ (b) $a = -200x^2$ (c) $a = -10x$ (d) $a = 100x^3$

A. $a = 0.7x$

B. $a = -200x^2$

C. $a = -10x$

D. $a = 100x^3$

Answer: C

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19. Which of the following functions of time represent (a) simple harmonic motion and (b) periodic but not simple harmonic motion? Give the period for each case.

(i)$\sin \omega t - \cos \omega t$ (ii) $\sin^2 \omega t$ (iii) $\cos \omega t + 2\sin^2 \omega t$

A. a simple harmonic motion with a period $\frac{\pi}{\omega}$

B. a simple harmonic motion with a period $\frac{2\pi}{\omega}$

C. a periodic, but not simple harmonic motion with a period $\frac{\pi}{\omega}$

D. a periodic, but not simple harmonic motion with a period $\frac{2\pi}{\omega}$

Answer: C

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20. If $f(x) = (x - x_0)\phi(x)$ and $\phi(x)$ is continuous at $x = x_0$ then what is $f(x_0)$ equal to ?

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

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

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

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

Answer: D

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21. The angular velocities of three bodies in SHM are $\omega_1, \omega_2, \omega_3$ with their respective amplitudes as A_1, A_2, A_3. If all three bodies have same mass and maximum velocity then

A. $A_1\omega_1 = A_2\omega_2 = A_3\omega_3$

B. $A_1\omega_1^2 = A_2\omega_2^2 = A_3\omega_3^2$

C. $A_1^2\omega_1 = A_2^2\omega_2 = A_3^2\omega_3$

D. $A_1^2\omega_1^2 = A_2^2\omega_2^2 = A_3^2\omega_3^2$

Answer: B

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22. Two simple harmonic motions are represented by the equations

$y_1 = 10 \sin(3\pi t + \pi / 4)$ and $y_2 = 5(\sin 3\pi t + \sqrt{3} \cos 3\pi t)$

their amplitude are in the ratio of ....

A. $\sqrt{3}$

B. $1 / \sqrt{3}$

C. 2

D. $1 / 6$

Answer: C

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23. A particle executes SHM of type $x = A \sin \omega t$. It takes time t_1 from $x = 0$ to $x = \frac{A}{2}$ and t_2 from $x = \frac{A}{2}$ to $x = A$. The ratio $t_1 : t_2$ will be

A. $1:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer: D

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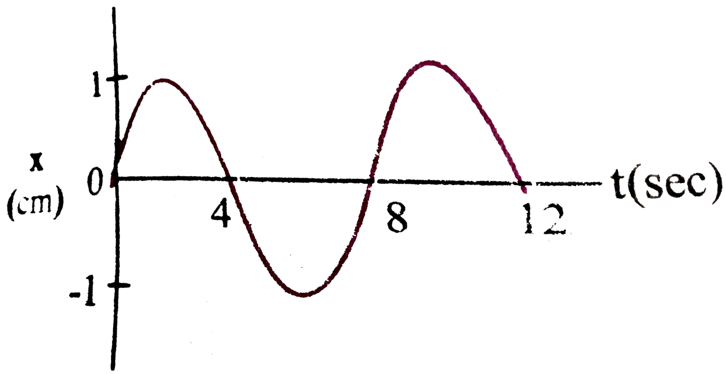
24. The $x-t$ graph of a particle undergoing simple harmonic motion is shown in figure. Acceleration of particle at $t=4/3s$ is



A. $\frac{\sqrt{3}}{32}\pi^2 cms^{-2}$

B. $\frac{-\pi^2}{32} cms^{-2}$

C. $\frac{\pi^2}{32} cms^{-2}$

D. $\frac{-\sqrt{3}}{32}\pi^2 cms^{-2}$

Answer: B

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25. The equation of motion of a particle executing simple harmonic motion is $a + 16\pi^2 x = 0$ In this equation, a is the linear acceleration in m/s^2 of the particle at a displacement x in meter. The time period in simple harmonic motion is

A. $\frac{1}{4}s$

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

C. 1 s

D. 2 s

Answer: A

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26. Which of the following motions is not simple harmonic?

A. vertical oscillations of a spring

B. motion of simple pendulum

C. motion of a planet around the sun

D. oscillation of liquid column in a U-tube

Answer: B

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27. A particle is executing simple harmonic motion with an amplitude A and time period T. The displacement of the particles after 2T period from its initial position is

A. A

B. 4A

C. 8A

D. zero

Answer: C

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28. If x, v and a denote the displacement, the velocity and the acceleration of a particle executing simple harmonic motion of time period T, then, which of the following does not change with time ?

A. $a^2T^2 + 4\pi^2v^2$

B. $\frac{aT}{x}$

C. $aT + 2\pi v$

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

Answer: A

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29. A particle executing SHM is described by the displacement function $x(t) = A\cos(\omega t + \phi)$, if the initial (t=0) position of the particle is 1 cm, its initial velocity is $\pi i \text{ cm } s^{-1}$ and its angular frequency is πs^{-1}, then the amplitude of its motion is

A. πcm

B. $2cm$

C. $\sqrt{2}cm$

D. $1cm$

Answer: A

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30. In SHM, kinetic energy is $(1/4)^{th}$ of the total energy at a displacement equal to

(Here A is the amplitude of oscillations.)

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

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

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

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

Answer: B

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31. If $<T>$ and $<U>$ denote the average kinetic and the average potential energies respectively of a mass executing a simple harmonic motion over one period, then the corresponding relation is

A. $<T> \; = \; -2 <U>$

B. $<T> \; = 2 <U>$

C. $<T> \; = \; <U>$

D. $<T> \; = \dfrac{<U>}{2}$

Answer: A

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32. Starting from the origin a body osillates simple harmonicall with a period of 2 s. A fter what time will its kinetic energy be 75% of the total energy?

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

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

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

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

Answer: A

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33. An object of mass $0.2kg$ executes simple harmonic oscillation along the $x - a\xi s$with a frequency of $(25 / \pi)Hz$. At the position $x = 0.04$, the object has Kinetic energy of $0.5J$ and potential energy `0.4 J. The amplitude of oscillations is......m.

A. 0.05 m

B. 0.06 m

C. 0.01 m

D. 0.02 m

Answer: B

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34. A certain simple harmonic vibrator of mass 0.1 kg has a total energy of 10 J. Its displacement from the mean position is 1 cm when it has equal kinetic and potential energies. The amplitude A and frequency n of vibration of the vibrator are

A. $A = \sqrt{2}cm, v = \frac{500}{\pi}Hz$

B. $A = \sqrt{2}cm, v = \frac{1000}{\pi}Hz$

C. $A = \frac{1}{\sqrt{2}}cm, v = \frac{500}{\pi}Hz$

D. $A = \frac{1}{\sqrt{2}}cm, v = \frac{1000}{\pi}Hz$

Answer: D

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35. A particle of mass m executes simple harmonic motion with amplitude a and frequency v. The average kinetic energy during its motion from the position of equilibrium to the ends is

A. $2p^2mA^2v^2$

B. $p^2mA^2v^2$

C. $\frac{1}{4}\pi^2mA^2v^2$

D. $4\pi^2mA^2v^2$

Answer: A

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36. The kinetic energy of paritcle executing SHm will be equal to $\left(\frac{1}{8}\right)^{th}$ of its potential energy when its displacement from the mean position is (Where A is the amplitude) :

A. $A\sqrt{2}$

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

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

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

Answer: C

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37. A particle starts oscillating simple harmonically from its equilibrium position then, the ratio of kinetic energy and potential energy of the particle at the time $T/12$ is: $(T = \text{time period})$

A. $1:2$

B. $2:1$

C. $3:1$

D. $4:1$

Answer: A

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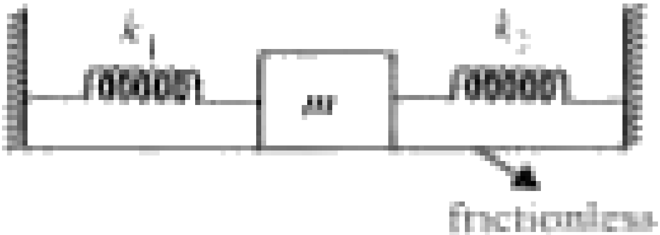
38. The frequency of the mass when it is displaced slightly is



A. $v=\frac{1}{2\pi}\sqrt{\frac{k_1k_2}{(k_1+k_2)m}}$

B. $v=\frac{1}{2\pi}\sqrt{\frac{k_1+k_2}{m}}$

C. $v=\frac{1}{2\pi}\sqrt{\frac{k_1k_2}{m}}$

D. $v=\frac{1}{2\pi}\sqrt{\frac{k_1+k_2}{k_1k_2m}}$

Answer: A

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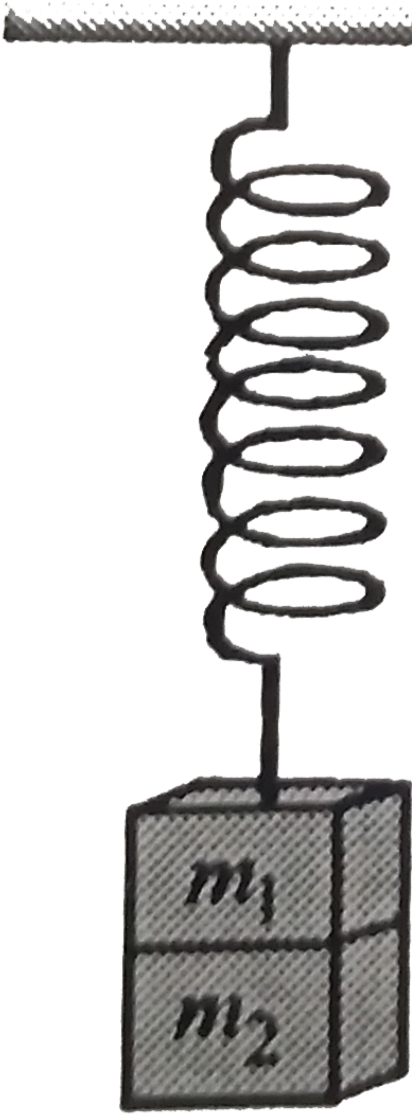
39. Two masses m1 and m2 are suspended together by a massless spring of constant k. When the masses are in equilibrium, m1 is removed without disturbing the system. The amplitude of oscillations is



A. $\frac{m_1 g}{k}$

B. $\frac{m_2 g}{k}$

C. $\frac{(m_1 + m_2)g}{k}$

D. $\frac{(m_1 - m_2)g}{k}$

Answer: D

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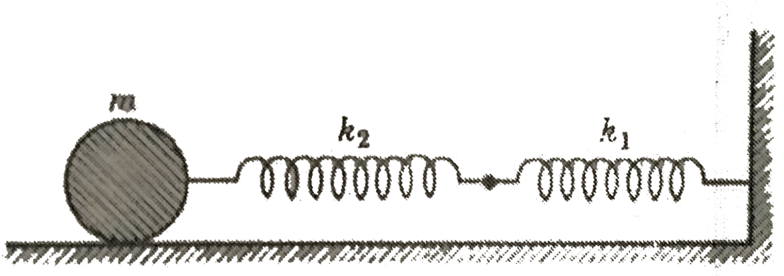
40. Two springs are jonied and connected to a mass m as shown in figure. If the force constants of the two springs are k_1 and k_2, shown that frequency of oscillation of mass m is



A. $\frac{1}{2\pi}\sqrt{\frac{k_1k_2}{(k_1+k_2)m}}$

B. $2\pi\sqrt{\frac{(k_1+k_2)m}{k_1k_2}}$

C. $2\pi\sqrt{\frac{k_1k_2}{m}}$

D. $\frac{1}{2\pi}\sqrt{\frac{m}{k_1+k_2}}$

Answer: C

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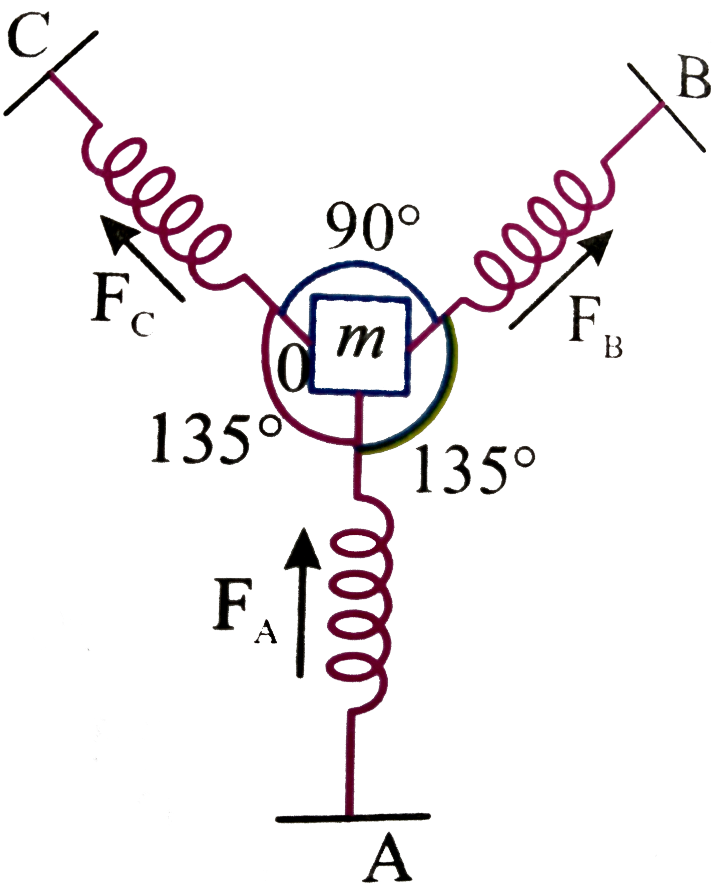
41. A particle of mass 'm' is attached to three identical springs A, B and C each of force constant 'K' as shown in figure. If the particle of mass 'm' is pushed slightly against the spring 'A' and released the period of oscillations is



A. $2\pi\sqrt{\frac{2m}{k}}$

B. $2\pi\sqrt{\frac{m}{2k}}$

C. $2\pi\sqrt{\frac{m}{k}}$

D. $2\pi\sqrt{\frac{m}{3k}}$

Answer: B

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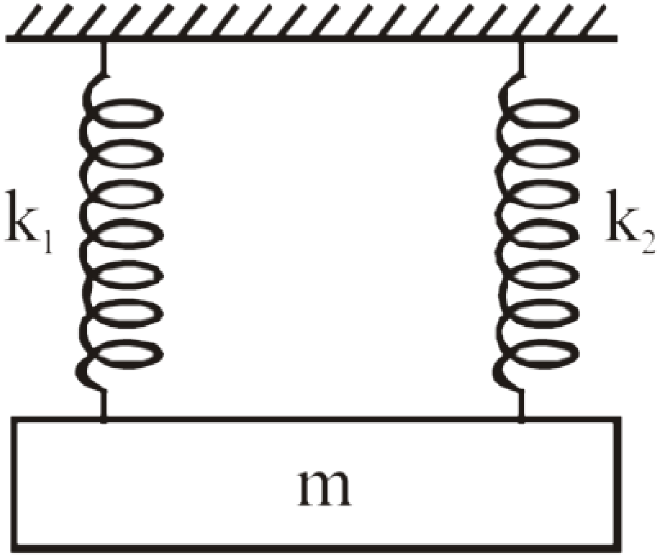
42. A mass is suspended separately by two different springs in successive order, then time periods is $t_1 \text{and} t_2$ respectively. It is connected by both springs as shown in fig. then time period is t_0. The correct relation is



A. $T_0^2 = T_1^2 + T_2^2$

B. $T_0^{-2} = T_1^{-2} + T_2^{-2}$

C. $T_0^{-1} = T_1^{-1} + T_2^{-1}$

D. $T_0 = T_1 + T_2$

Answer: B

Watch Video Solution

43. A verticle mass-spring system executed simple harmonic ascillation with a period $2s$ quantity of this system which exhibits simple harmonic motion with a period of $1 \sec$ are

A. velocity

B. potential energy

C. phase difference between acceleration and displacement

D. difference between kinetic energy and potential energy

Answer: A

Watch Video Solution

44. A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then the long piece will have a force constant of :

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

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

C. $3k$

D. $6k$

Answer: D

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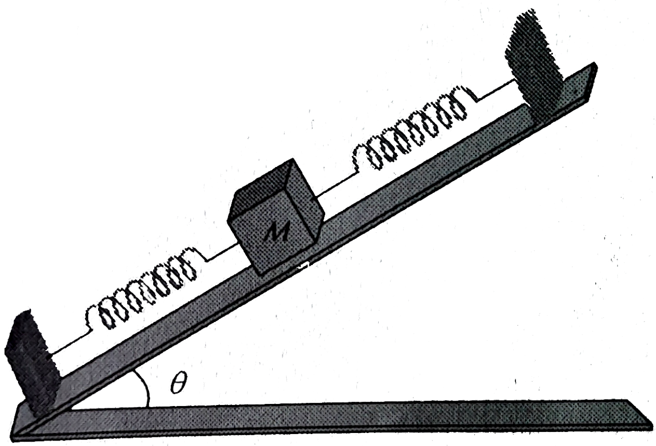
45. On a smooth inclined plane, a body of mass M is attached between two springs. The other ends of the springs are fixed to firm supports. If each spring has force constant K , the period of oscillation of the body (assuming the springs as massless) is



A. $2\pi(M/2k)^{1/2}$

B. $2\pi(2M/k)^{1/2}$

C. $2\pi(Mg\sin\theta/2k)$

D. $2\pi(2Mg/k)^{1/2}$

Answer: D

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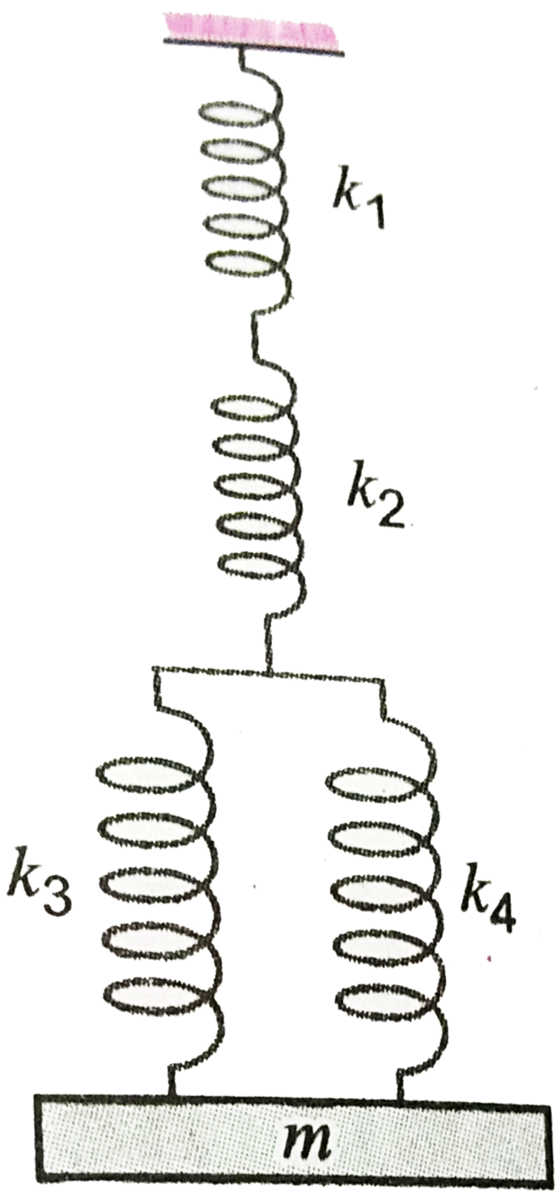
46. A system of springs with their spring constants are as shown in figure. What is the frequency of oscillations of the mass m ?



A. $\frac{1}{2\pi}\sqrt{\frac{k_1k_2(k_3+k_4)}{[(k_1+k_2)+(k_3+k_4)+k_1k_4]m}}$

B. $\frac{1}{2\pi}\sqrt{\frac{k_1k_2(k_3+k_4)}{[(k_1+k_2)+(k_3+k_4)+k_1k_2]m}}$

C. $\frac{1}{2\pi}\sqrt{\frac{k_1k_2(k_3+k_4)}{[(k_1+k_2)(k_3+k_4)+k_1k_2]m}}$

D. $\frac{1}{2\pi}\sqrt{\frac{(k_1+k_2)(k_3+k_4)+k_1k_2}{k_1k_2(k_3+k_4)m}}$

Answer: B

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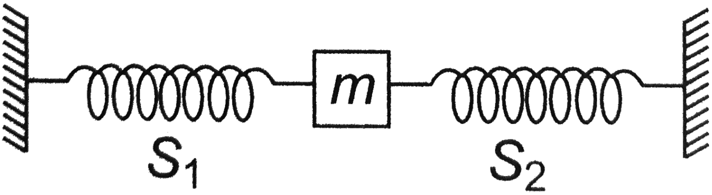
47. In figure S_1 and S_1 are identical springs. The oscillation frequency of the mass m is f. if one spring is removed, the frequency will become



A. v

B. $2v$

C. $\sqrt{2}v$

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

Answer: C

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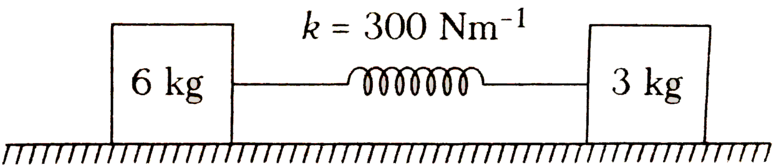
48. Two point masses of 3 kg and 6 kg are attached to opposite ends of horizontal spring whose spring constant is $300 Nm^{-1}$ as shown in the figure. The natural vibration frequency of the system is approximately



A. 4 Hz

B. 3 Hz

C. 2 Hz

D. 1 Hz

Answer: B

Watch Video Solution

49. If a spring of force constant k is divided into n equal parts , then force constant of each part is

A. $\frac{n}{n+1}k$

B. $\left(\frac{n}{n+1}\right)k$

C. nk

D. $\frac{k}{n+1}$

Answer: B

Watch Video Solution

50. Two springs of constants k_1 and k_2 have equal maximum velocities, when executing simple harmonic motion. The ratio of their amplitudes (masses are equal) will be

A. $\frac{k_1}{k_2}$

B. $\left(\frac{k_1}{k_2}\right)^{1/2}$

C. $\frac{k_2}{k_1}$

D. $\left(\frac{k_2}{k_1}\right)^{1/2}$

Answer: B

Watch Video Solution

51. The length of a spring is α when a force of $4N$ is applied on it and the length is β when $5N$ is applied. Then the leng of spring when $9N$ force is applied is-

A. $5\beta - 4\alpha$

B. $\beta - \alpha$

C. $5\alpha - 4\beta$

D. $9(\beta - \alpha)$

Answer: B

Watch Video Solution

52. Let T_1 and T_2 be the periods of springs A and B when mass M is suspended from one end of each spring. If both springs are taken in series and the same mass M is, suspended from the séries combination, the time period is T, then

A. $T = T_1 + T_2$

B. $\frac{1}{T} = \frac{1}{T_1} + \frac{1}{T_2}$

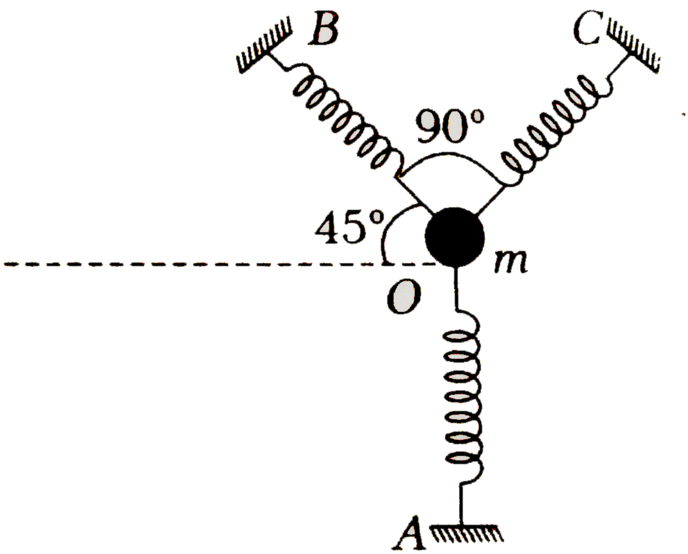
C. $T^2 = T_1^2 + T_2^2$

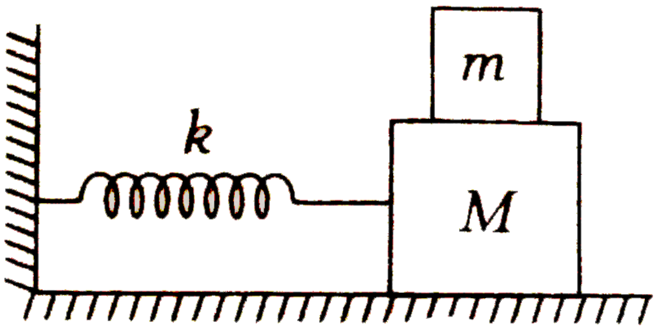
D. $\frac{1}{T^2} = \frac{1}{T_1^2} + \frac{1}{T_2^2}$

Answer: D

Watch Video Solution

53. A mass M is attached to a horizontal spring of force constant k fixed one side to a rigid support as shown in figure. The mass oscillates on a frictionless surface with time period T and amplitude A. When the mass M is in equilibrium position, another mass m is gently placed on it. When will be the new amplitude of ocillation?





A. $A\sqrt{\dfrac{M}{M-m}}$

B. $A\sqrt{\dfrac{M-m}{M}}$

C. $A\sqrt{\dfrac{M}{M+m}}$

D. $A\sqrt{\frac{M+m}{M}}$

Answer: C

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54. A particle of mass 0.1 kg is held between two rigid supports by two springs of force constant $8Nm^{-1}$ and $2Nm^{-1}$. If the particle is displaced along the direction of length of the springs, its frequency of vibration is

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

B. $\frac{8}{\pi}Hz$

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

D. $\frac{1}{\pi} Hz$

Answer: A

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55. A weightless spring of length 60 cm and force constant $200 Nm^{-1}$ is kept straight and unstretched on a smooth horizontal table and its ends are rigidly fixed. A mass of 0.25 kg is attached at the middle of the spring and is slightly displaced along the length. The time period of the oscillation of the mass is

A. $\frac{\pi}{20} s$

B. $\frac{\pi}{10} s$

C. $\frac{\pi}{5}s$

D. $\frac{\pi}{\sqrt{200}}s$

Answer: B

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56. One end of a long metallic wire of length (L) is tied to the ceiling. The other end is tied to a massless spring of spring constant . (K.A) mass (m) hangs freely from the free end of the spring. The area of cross- section and the Young's modulus of the wire are (A) and (Y) respectively. If the mass is slightly pulled down and released, it will oscillate with a time period (T) equal to :

A. $2\pi\sqrt{\frac{m}{k}}$

B. $2\pi\sqrt{\frac{m(YA+kL)}{YAk}}$

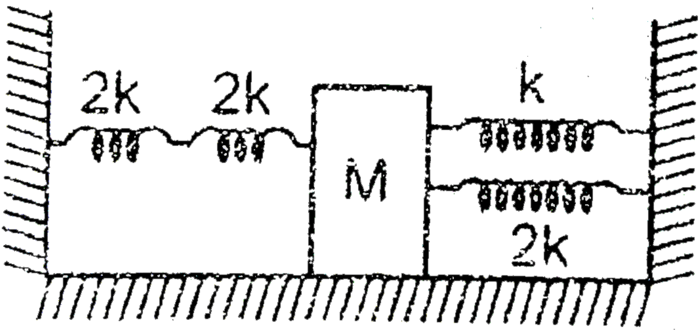
C. $2\pi\sqrt{\frac{mYA}{kL}}$

D. $2\pi\sqrt{\frac{mL}{YA}}$

Answer: C

Watch Video Solution

57. Four massless springs whose force constants are $2k, 2k, k$ and $2k$ respectively are attached to a mass M kept on a fricaionless plane (as shown in figure). If the mass M is displaced in the horizontal directions, then the frequency of the system.



A. $\frac{1}{2\pi}\sqrt{\frac{k}{4M}}$

B. $\frac{1}{2\pi}\sqrt{\frac{4k}{M}}$

C. $\frac{1}{2\pi}\sqrt{\frac{k}{7M}}$

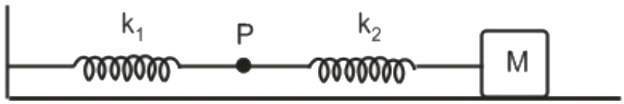
D. $\frac{1}{2\pi}\sqrt{\frac{7k}{M}}$

Answer: A

Watch Video Solution

58. The mass M shown in figure ocillates in simple harmonic motion with amplitude A.

The amplitude of the point P is



A. $\dfrac{k_1 A}{k_2}$

B. $\dfrac{k_2 A}{k_1}$

C. $\dfrac{k_1 A}{k_1 + k_2}$

D. $\dfrac{k_2 A}{k_1 + k_2}$

Answer: A

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59. An electric motor of mass 40 kg is mounted on four vertical springs each having spring constant of $4000 N m^{-1}$. The period with which the motor vibrates vertically is

A. 0.314 s

B. 3.14 s

C. 0.628 s

D. 0.157 s

Answer: A

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60. A metal wire of length L_1 and area of cross section A is ttached to a rigid support. Another metal wire of length L_2 and of the same cross sectional area is attached to the free end of the first wire. A body of mass M is then suspended from the free end of the second wire, if Y_1 and Y_2 are the Young's moduli of the wires respectively the effective force constant of the system of two wires is

A. $\frac{[(Y_1 Y_2) A]}{[2(Y_1 L_2 + Y_2 L_1)]}$

B. $\frac{[(Y_1 Y_2) A]}{(L_1 L_2)^{1/2}}$

C. $\frac{[(Y_1 Y_2) A]}{(Y_1 L_2 + Y_2 L_1)}$

D. $\frac{(Y_1 Y_2)^{1/2} A}{(L_1 L_2)^{1/2}}$

Answer: C

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61. A body of mass 4.9 kg hangs from a spring and oscillates with a period 0.5 s. On the removal of the body, the spring is shortened by (Take $g = 10ms^{-2}, \pi^2 = 10$)

A. 0.625 cm

B. 0.63 cm

C. 6.25 cm

D. 63 cm

Answer: C

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62. A mass of 4 kg suspended from a spring of spring constant $800 N m^{-1}$ executes simple harmonic oscillations. If the total energy of the oscillator is 4 J, the maximum acceleration (in $m s^{-2}$) of the mass is

A. 5

B. 15

C. 45

D. 20

Answer: D

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63. A trolley moves in horizontal direction with an acceleration a. A simple pendulum of length l is suspended from the roof of the trolley. The time period of the pendulum will be

A. infinity

B. zero

C. $2\pi\sqrt{\frac{l}{(g+a)}}$

D. $2\pi\sqrt{\frac{l}{\sqrt{a^2+g^2}}}$

Answer: D

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64. If the metal bob of a simple pendulum is replaced by a wooden bob, then its time period will

A. increase

B. decrease

C. remain the same

D. be first (a) then (b)

Answer: B

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65. A pendulum suspended from the roof of an elevator at rest has a time period T_1, when the elevator moves up with an acceleration a its time period becomes T_2, when the elevator moves down with an acceleration a, its time period becomes T_3, then

A. $T_1 = \sqrt{(T_2 T_3)}$

B. $T_1 = \sqrt{(T_2^2 + T_3^2)}$

C. $T_1 = \dfrac{\sqrt{2} T_2 T_3}{\sqrt{T_2^2 + T_3^2}}$

D. none of these

Answer: C

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66. What is the length of a simple pendulum which ticks second?

A. 1 m

B. 2 m

C. 3 m

D. 4 m

Answer: B

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67. A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface, where R is the radius of the earth. The value of $\frac{T_2}{T_1}$ is

A. 1

B. $\sqrt{2}$

C. 4

D. 2

Answer: B

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68. Two simple pendulums have time periods T and $5T/4$. They start vibrating at the same instant from the mean position in the same phase. The phase difference between them when the pendulum with higher time period complets one oscillation is

A. 4T

B. 3T

C. 6T

D. 5T

Answer: C

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69. A man measures the period of a simple pendulum inside a stationary lift and finds it to be T sec. if the lift accelerates upwards with an acceleration g/4, then the period of the pendulum will be

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

B. $\frac{\sqrt{5}T}{2}$

C. $\frac{\sqrt{5}}{2T}$

D. $\frac{2}{\sqrt{5}T}$

Answer: B

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70. The acceleration due to gravity on the surface of the moon is $1.7ms^{-2}$. What is the time perioid of a simple pendulum on the surface of the moon, if its time period on the surface of earth is $3.5s$? Take $g = 9.8ms^{-2}$ on the surface of the earth.

A. 6.4 s

B. 7.4 s

C. 8.4 s

D. 9.4 s

Answer: D

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71. The length of second pendulum is 1 m on earth. If mass and diameter of the planet is doubled than that of earth, then length becomes

A. 1 m

B. 2 m

C. 0.5 m

D. 4 m

Answer: C

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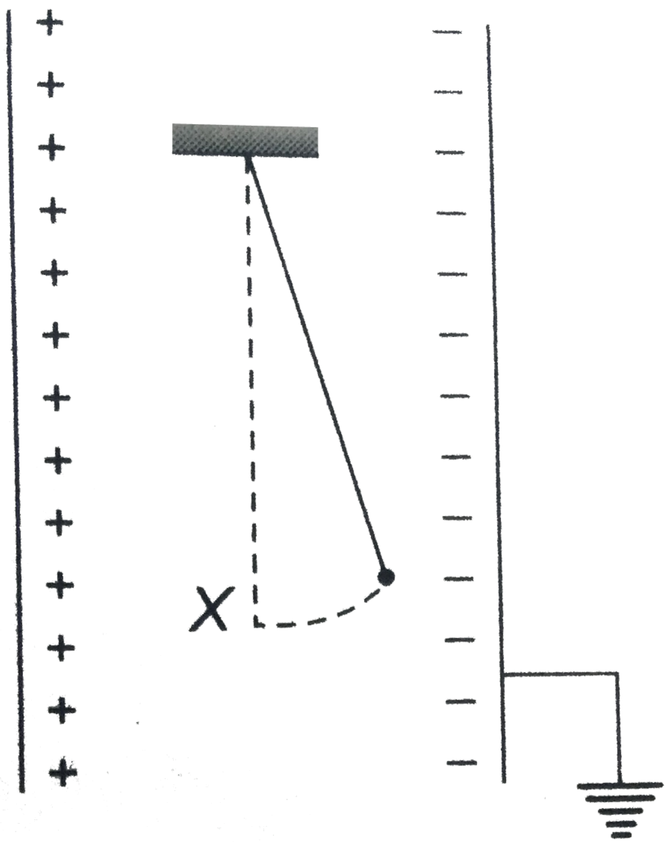
72. A simple pendulum has a length l, mass of bob m. The bob is given a charge q.The pendulum is suspended between the vertical plates of charged parallel plate capacitor. If E is the field strength between the plates ,then time period $T =$



A. $T = 2\pi\sqrt{\frac{l}{g}}$

B. $T = 2\pi\sqrt{\frac{l}{\left(g - \frac{qE}{m}\right)}}$

C. $T = 2\pi\sqrt{\frac{l}{\left(g + \frac{qE}{m}\right)}}$

D. $T = 2\pi\sqrt{\frac{l}{\left[g^2 + \left(\frac{qE}{m}\right)^2\right]^{1/2}}}$

Answer: B

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73. Time period of a simple pendulum of length L is T_1 and time period of a uniform rod of the same length L pivoted about an end and oscillating in a vertical plane is T_2. Amplitude of osciallations in both the cases is small. Then $\frac{T_1}{T_2}$ is

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

B. 1

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

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

Answer: B

Watch Video Solution

74. What effect occurs on the frequency of a pendulum if it is taken from the earth surface to deep into a mine

A. Increase

B. decrease

C. First increase and decrease

D. Remains unchanged

Answer: A

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75. A simple pendulum has time period (T_1). The point of suspension is now moved upward according to the relation $y = Kt^2, (K = 1m/s^2)$ where (y) is the vertical displacement. The time period now becomes (T_2). The ratio of $\frac{T_1^2}{T_2^2}$ is $(g = 10m/s^2)$.

A. $\frac{6}{5}$

B. $\frac{5}{6}$

C. 1

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

Answer: D

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76. The bob of simple pendulum executes SHM in water with a period T, while the period of oscillation of the bob is T_0 in air. Neglecting frictional force of water and given that the density of the bob is $\frac{4000}{3} kgm^{-3}$, find the ration between T and T_0.

A. $T = T_0$

B. $T = 4T_0$

C. $T = 2T_0$

D. $T = \frac{T_0}{2}$

Answer: A

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77. A disc of radius $R = 10cm$ oscillates as a physical pendulum about an axis perpendicular to the plane of the disc at a distance r from its centre. If $r = \frac{R}{4}$, the approximate period of oscillation is (Take $g = 10ms^{-2}$)

A. 0.84 s

B. 0.94 s

C. 1.26 s

D. 1.42 s

Answer: C

View Text Solution

78. There is a rod of length l and mass m. It is hinged at one end to the ceiling. The period of small oscillation is

A. $T = 2\pi\sqrt{\left(\frac{2l}{3g}\right)}$

B. $T = \pi\sqrt{\left(\frac{l}{3g}\right)}$

C. $T = 2\pi\sqrt{\left(\frac{l}{3g}\right)}$

D. $T = 2\pi\sqrt{\left(\frac{l}{g}\right)}$

Answer: D

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79. When an oscillator completes 100 oscillations its amplitude reduced to $\frac{1}{3}$ of initial values. What will be amplitude, when it completes 200 oscillations :

A. $\frac{1}{8}$

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

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

D. $\frac{1}{9}$

Answer: C

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80. The amplitude of damped oscillator becomes $\frac{1}{3}$ in $2s$. Its amplitude after $6s$ is $1/n$ times the original. The value of n is

A. 3^2

B. $\sqrt[3]{3}$

C. 2^3

D. 3^3

Answer: A

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81. A particle oscillating under a force $\vec{F} = -k\vec{x} - b\vec{v}$ is a (k and b are constants)

A. simple harmonic oscillator

B. linear oscillator

C. damped oscillator

D. forced oscillator

Answer: B

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82. Resonance is an example of

A. forced oscillation

B. damped oscillation

C. free oscillation

D. none of these

Answer: B

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83. In case of force oscillations of a body

A. driving force is constant throughout

B. driving force is to be applied only momentarily

C. driving force has to be periodic and continuous

D. driving force is not required

Answer: A

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84. 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. 1, 2, 4

B. 1, 3, 4

C. 1, 2, 3

D. all

Answer: B

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85. A wave is represented by $y = 0.4\cos\left(8t - \frac{x}{2}\right)$ where x and y are in metres and t in seconds. The frequency of the wave is

A. $\frac{4}{\pi}s^{-1}$

B. $\frac{8}{\pi}s^{-1}$

C. $\frac{5}{\pi}s^{-1}$

D. $\frac{6}{\pi}s^{-1}$

Answer: B

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86. The equation of a wave travelling in a string can be written as $y = 3\cos\pi(100t - x)$. Its wavelength is

A. 3 cm

B. 10 cm

C. 2 cm

D. 5 cm

Answer: B

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87. In a sinusoidal wave, the time required for a particular point to move from maximum displacement to zero displacement is 0.170 second. The frequency of the wave is

A. 1.47 Hz

B. 0.36 Hz

C. 0.73 Hz

D. 2.94 Hz

Answer: D

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88. 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. $\alpha = 12.50\pi, \beta = \frac{\pi}{2.0}$

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

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

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

Answer: A

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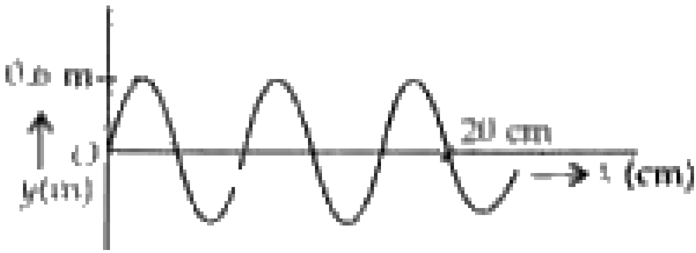
89. What is the wavelength of wave shown in given figure?



A. 0.6 m

B. 0.3 m

C. 0.08 m

D. 4 cm

Answer: A

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90. 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. varies with time

B. varies with distance separating them

C. varies with time as well as distance

D. is always zero

Answer: C

Watch Video Solution

91. Consider a wave rpresented by $y = a\cos^2(\omega t - kx)$ where symbols have their usual meanings. This wave has

A. Bak

B. $B(A/k)^{1/2}$

C. B

D. $B(Ak)^{1/2}$

Answer: C

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92. A string of linear density 0.2 kg/m is stretched with a force of 500 N. A transverse wave of length 4.0 m in set up along it. The speed of wave is

A. 50 m/s

B. 75 m/s

C. 150 m/s

D. 200 m/s

Answer: A

Watch Video Solution

93. The eqyation of wave is $x = 5 \sin\left(\frac{t}{0.4} - \frac{x}{4}\right) cm$ the maximum velocity of the particles of the medium is

A. 1 m/s

B. 1.5 m/s

C. 1.25 m/s

D. 2 m/s

Answer: C

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94. A progressive wave of frequency 500Hz is travelling with a velocity of 360 m / s. How far part are two points

60° out of phase ?

A. 0.12 m

B. 0.22 m

C. 0.32 m

D. 0.42 m

Answer: B

Watch Video Solution

95. If the distance between successive compressions and rarefactions is 1 m and velocity of sound is $360 ms^{-1}$, then the frequency is

A. 180 Hz

B. 45 Hz

C. 120 Hz

D. 90 Hz

Answer: D

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96. In brass the velocity of longitudinal wave is 100 times the velocity of transverse wave if $Y = 1 \times 10^{11} N/m^2$, then stress in the wire is

A. $1 \times 10^{13} N/m^2$

B. $1 \times 10^{9} N / m^{2}$

C. $1 \times 10^{11} N / m^{2}$

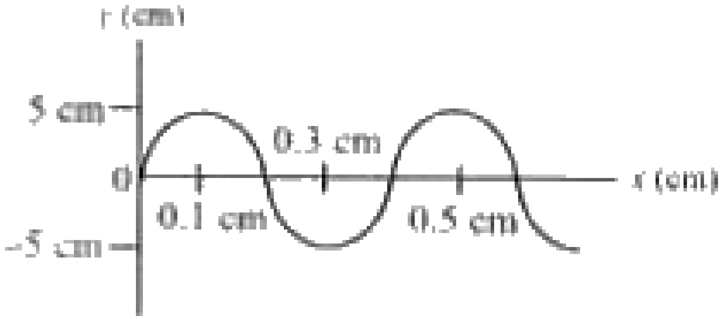
D. $1 \times 10^{7} N / m^{2}$

Answer: B

Watch Video Solution

97. Figure shows the shape of part of a long string in which transverse waves are produced by attaching one end of the string to tuning fork of frequency 250 Hz.

What is the velocity of the waves?



A. $1.0ms^{-1}$

B. $1.5ms^{-1}$

C. $2.0ms^{-1}$

D. $2.5ms^{-1}$

Answer: C

Watch Video Solution

98. 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. 300

B. 600

C. 1200

D. 200

Answer: D

Watch Video Solution

99. The linear density of a vibrating string is $10^{-4} kg/m$. A transverse wave is propagating on the string, which is described by the equation $y = 0.02 \sin(x + 30t)$, where x and y are in metres and time t in seconds. Then tension in the string is

A. 0.09 N

B. 0.36 N

C. 0.9 N

D. 3.6 N

Answer: B

Watch Video Solution

100. 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. 0.06 m

B. 0.03 m

C. 0.12 m

D. 0.09 m

Answer: C

Watch Video Solution

101. Oxygen is 16 times heavier than hydrogen. At NTP equal volumn of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is

A. $\sqrt{8}$

B. $\sqrt{2/17}$

C. $\sqrt{1/8}$

D. $\sqrt{32/17}$

Answer: B

Watch Video Solution

102. What will be the wave velocity, if the radar gives 54 waves per min and wavelength of the given wave is 10 m

A. 4 m/s

B. 6 m/s

C. 9 m/s

D. 5 m/s

Answer: B

Watch Video Solution

103. A wave is represented by the equation

$y = 0.1 \sin(100\pi t - kx)$

If wave velocity is $100ms^{-1}$, its wave number is equal to

A. 1 m

B. 2 m

C. π m

D. 2π m

Answer: C

Watch Video Solution

104. A unifrom rope of mass 0.1kg and length 2.45 m hangs from a rigid support. The time taken by the transverse wave formed in the rope to travel through the full length of the rope is (Assume g= $= 9.8m/s^2$)

A. 1 s

B. 2 s

C. 3 s

D. 4 s

Answer: A

Watch Video Solution

105. A uniform wire of length 20 m and weighing 5 kg hangs vertically. If $g = 10ms^{-2}$, then the speed of transverse waves in the middle of the wire is

A. 10 m/s

B. $10\sqrt{2}$ m/s

C. 4 m/s

D. zero

Answer: A

Watch Video Solution

106. 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. 8 m/s

B. 4π m/s

C. 0.5π m/s

D. $\frac{\pi}{4}$ m/s

Answer: D

Watch Video Solution

107. Velocity of sound in a gaseous medium is $330ms^{-1}$. If the pressure is increased by 4 times without change in temperature, the velocity of sound in the gas is

A. $330ms^{-1}$

B. $660ms^{-1}$

C. $156ms^{-1}$

D. $990ms^{-1}$

Answer: A

Watch Video Solution

108. A string is hanging from a rigid support. A transverse

pulse is excited at its free end. The speed at which the pulse travels a distance x is proportional to

A. x

B. $\frac{1}{x}$

C. $\frac{1}{\sqrt{x}}$

D. $\sqrt{x}$

Answer: D

Watch Video Solution

109. At what temperature will the speed of sound in air be 3 times its value at 0° C?

A. $1184^\circ C$

B. $1148^\circ C$

C. $2184^\circ C$

D. $2148^\circ C$

Answer: A

Watch Video Solution

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

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

C. $\lambda = \pi y_0$

D. $\lambda = 2\pi y_0$

Answer: C

Watch Video Solution

111. An observer standing near the sea-coast counts 48 waves per min. If the wavelength of the wave is 10 m, the velocity of the waves will be

A. 8 m/s

B. 12 m/s

C. 16 m/s

D. 20 m/s

Answer: A

Watch Video Solution

112. The speed of sound in oxygen (O_2) at a certain temperature is $460ms^{-1}$. The speed of sound in helium (He) at the same temperature will be (assume both gases to be ideal)

A. $330ms^{-1}$

B. $1420ms^{-1}$

C. $500ms^{-1}$

D. $650ms^{-1}$

Answer: C

Watch Video Solution

113. A bat emits ultrasonic sound of frequency 100 kHz in air. If this sound meets a water surface, the wavelengths of the reflected and transmitted sound are (Speed of sound in air = 340 m s^{-1} and in water = 1500 m s^{-1})

A. $3.4 \times 10^{-3} m$

B. $1.49 \times 10^{-2} m$

C. $3.4 \times 10^{-2} m$

D. $1.49 \times 10^{-3} m$

Answer: C

Watch Video Solution

114. If the bulk modulus of water is 2100 M Pa, what is the speed of sound in water ?

A. $1450ms^{-1}$

B. $2100ms^{-1}$

C. $0.21ms^{-1}$

D. $21ms^{-1}$

Answer: C

Watch Video Solution

115. Velocity of sound measured at a given temperature in oxygen and hydrogen is in the ratio -

A. $4:1$

B. $1:4$

C. $1:1$

D. $2:1$

Answer: A

Watch Video Solution

116. 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. 165 Hz

B. 150 Hz

C. 660 Hz

D. 330 Hz

Answer: C

Watch Video Solution

117. A string of length 10.0 m and mass 1.25kg stretched with a tension of 50N. If a transverse pulse is created at one end of the string, how long does it take to reach the other end ?

A. 0.5 s

B. 1.0 s

C. 1.5 s

D. 2.0 s

Answer: B

Watch Video Solution

118. If the young's modulus of the material of the rod is $2 \times 10^{11} N/m^2$ and its density is $8000 kg/m^3$ then the time taken by a sound wave to traverse 1m of the rod will be

A. $3 \times 10^{-4}s$

B. $2 \times 10^{-4}s$

C. $3 \times 10^{-2}s$

D. $2 \times 10^{-2}s$

Answer: C

Watch Video Solution

119. At a given temperature, the pressure of an ideal gas of density ρ is proportional to

A. $\left(\frac{P}{\rho}\right)^2$

B. $\left(\frac{P}{\rho}\right)^{3/2}$

C. $\sqrt{\frac{\rho}{P}}$

D. $\sqrt{\frac{P}{\rho}}$

Answer: B

Watch Video Solution

120. The pressure variations in the propagation of sound waves in gaseous medium are

A. adiabatic

B. isothermal

C. isobaric

D. isochoric

Answer: A

Watch Video Solution

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

A. zero

B. $\pi / 4$

C. $\pi / 2$

D. π

Answer: C

Watch Video Solution

122. The displacement of a wave disturbance propagating in the positive x-direction is given by

$y = \frac{1}{1+x^2}$ at $t = 0$ and $y = \frac{1}{1+(x-1)^2}$ at $t = 2s$

where, x and y are in meter. The shape of the wave disturbance does not change during the propagation. what is the velocity of the wave?

A. $1ms^{-1}$

B. $0.5ms^{-1}$

C. $1.5ms^{-1}$

D. $2ms^{-1}$

Answer: B

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123. $x_1 = A\sin(\omega t - 0.1x)$ and $x_2 = A\sin\left(\omega t - 0.1x - \frac{\phi}{2}\right)$ Resultant amplitude of combined wave is

A. $2A\cos.\ \frac{\phi}{4}$

B. $A\sqrt{2\cos.\ \frac{\phi}{2}}$

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

D. $A\sqrt{2\left(1 + \cos.\ \frac{\phi}{4}\right)}$

Answer: C

Watch Video Solution

124. If the two waves of the same frequency and same amplitude, on superposition produce a resultant disturbance of the same amplitude, then the phase difference between the two arriving wave will be

A. π

B. zero

C. $\pi / 3$

D. $2\pi / 3$

Answer: C

Watch Video Solution

125. Two identical sinusoidal waves each of amplitude 5 mm with a phase difference of $\pi/2$ are traveling in the same direction in a string. The amplitude of the resultant wave (in mm) is

A. zero

B. $5\sqrt{2}$

C. $\frac{5}{\sqrt{2}}$

D. `2.5

Answer: B

Watch Video Solution

126. Two sound waves travel in the same direction in a medium. The amplitude of each wave is A and the phase difference between the two waves is 120°. The resultant amplitude will be

A. $\sqrt{2}A$

B. 2A

C. 3A

D. A

Answer: A

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127. Stationary waves of frequency 300 Hz are formed in a medium in which the velocity of sound is 1200 metre / sec . The distance between a node and the neighbouring antinode is

A. 1 m

B. 2 m

C. 3 m

D. 4 m

Answer: B

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128. Standing waves are produced by the superposition of

two waves

$y_1 = 0.05 \sin(3\pi t - 2x)$ and $y_2 = 0.05 \sin(3\pi t + 2x)$

Where x and y are in metres and t is in second. What is the amplitude of the particle at $x = 0.5$ m ? (Given, $\cos 57.3^\circ = 0.54$)

A. 2.7 cm

B. 5.4 cm

C. 8.1 cm

D. 10.8 cm

Answer: C

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129. The stationary wave $y = 2a \sin kx \cos \omega t$ in a closed organ pipe is the result of the superposition of $y = a \sin(\omega t - kx)$

A. $y_2 = -a \cos(\omega t + kx)$

B. $y_2 = -a \sin(\omega t - kx)$

C. $y_2 = a \sin(\omega t - kx)$

D. $y_2 = a \cos(\omega t + kx)$

Answer: A

Watch Video Solution

130. A wave frequency $100Hz$ travels along a string towards its fixed end . When this wave travels back after reflection , a node is formed at a distance of $10cm$from the fixed end . The speed of the wave (incident and reflected) is

A. 5 m/s

B. 20 m/s

C. 10 m/s

D. 40 m/s

Answer: D

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131. 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. $\sqrt{2}$ that of the individual waves

Answer: B

Watch Video Solution

132. Stationary waves of frequency 200 Hz are formed in air. If the velocity of the wave is $360ms^{-1}$, the shortest distance between two antinodes is

A. 1.8 m

B. 3.6 m

C. 0.9 m

D. 0.45 m

Answer: C

Watch Video Solution

133. Distance between nodes on a string is 5 cm. Velocity of transverse wave is $2ms^{-1}$. Then the frequency is

A. 5 Hz

B. 10 Hz

C. 20 Hz

D. 15 Hz

Answer: C

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134. If the air column in a pipe which is closed at one end, is in resonance with a vibrating tuning fork at a frequency 260 Hz, then the length of the air column is

A. 35.7 cm

B. 31.7 cm

C. 12.5 cm

D. 62.5 cm

Answer: B

Watch Video Solution

135. An open and closed organ pipe have the same length the ratio pth mode of frequency of vibration of air in two pipe is

A. 1

B. p

C. $p(2p+1)$

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

Answer: B

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136. The equation of stationary wave along a stretched string is given by $y = 5\sin\left(\frac{\pi x}{3}\right)\cos 40\pi t$, where x and y are in cm and t in second. The separation between two adjacent nodes is

A. 5 cm

B. 3 cm

C. 6 cm

D. 40 cm

Answer: B

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137. Pick out the correct statement in the following with reference to stationary wave pattern.

A. In a tube open at both end, all the harmonics are present

B. In a tube open at one end, only even harmonics are present

C. The distance between successive nodes is equal to the wavelength

D. In a stretched string, the first overtone is the same as the second harmonic.

Answer: A,D

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138. If the length of a stretched string is shortened by 40% and the tension is increased by 44%, then the ratio of the final and initial fundamental frequencies is

A. $3:4$

B. $4:3$

C. $1:3$

D. $2:1$

Answer: B

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139. An organ pipe closed at one end restonates with a tuning fork of frequencies 180 Hz and 300 Hz it will also resonate with tuning fork of frequencies

A. 360 Hz

B. 420 Hz

C. 480 Hz

D. 600 Hz

Answer: B

Watch Video Solution

140. For a certain organ pipe three successive resonance frequencies are observed at 425Hz, 595 Hz and 765Hz respectively. If the speed of sound air is 340m/s, then the length of the pipe is

A. 2.0 m

B. 0.4 m

C. 1.0 m

D. 0.2 m

Answer: A

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141. A closed organ pipe (closed at one end) is excited to support the third overtone. It is found that air in the pipe has

A. 3 nodes and 3 antinodes

B. 3 nodes and 4 antinodes

C. 4 nodes and 3 antinodes

D. 4 nodes and 4 antinodes

Answer: A

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142. Which of the following statements is wrong?

A. In an open pipe the fundamental frequency is $v/2l$

B. In a closed pipe the closed end is a node

C. In an open pipe only the odd harmonics of fundamental frequency are present

D. In a closed pipe the fundamental frequency is $v/4I$

Answer: D

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143. Regarding an open organ pipe , which of the following is correct?

A. Both the ends are pressure antinodes

B. Both the ends are displacement nodes

C. Both ends are pressure nodes

D. none of these

Answer: C

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144. Two uniform strings A and B made of steel are made to vibrate under the same tension. If the first overtone of A is equal to the second overtone of B and if the radius of A is twice that of B, the ratio of the lengths of the strings is

A. $1:2$

B. $1:3$

C. $1:4$

D. $1:6$

Answer: D

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145. A pipe closed at one end produces a fundamental note of frequency 412 Hz. If it is cut into two pieces of equal lengths , then the fundamental frequencies produced by the two pieces would be

A. 206 Hz, 412 Hz

B. 824 Hz, 1648 Hz

C. 412 Hz, 824 Hz

D. 206 Hz, 824 Hz

Answer: C

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146. A glass tube is open at both the ends. A tuning fork of

frequency f resonates with the air column inside the

tude. Now, the tube is placed vertically inside water

so that half the length of the tube is filled with water.

Now, the air column inside the tube is in unison with

another fork of frequency f' . Then

A. $v' = v$

B. $v' = 4v$

C. $v' = 2v$

D. $v' = v/2$

Answer: D

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147. The second overtone of an open pipe has the same frequency as the first overtone of a closed pipe 2 m long. The length of the open pipe is

A. 8 m

B. 4 m

C. 2 m

D. 1 m

Answer: B

148. A pipe opened at both ends prpduces a note of frequency f_1. When the pipe is kept with $\frac{3}{4}th$ of its length in water, it produces a note of frequency f_2. The ratio $\frac{f_1}{f_2}$ is

A. $4/3$

B. $3/4$

C. 2

D. $1/2$

Answer: B

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149. A glass tube of length 1.0 m is completely filled with water. A vibrating tuning fork of frequency 500 Hz is kept over the mouth of the tube and the water is drained out slowly at the bottom of the tube. If the velocity of sound in air is 330 ms^{-1}, then the total number of resonances that occur will be

A. 2

B. 3

C. 1

D. 5

Answer: D

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150. The fundamental frequency of an open organ pipe is 300Hz. The first overtone of this has same frequency as that of first overtone of a closed organ pipe. If speed of sound is 330m/s, then the length of closed of organ pipe will be

A. 41 cm

B. 37 cm

C. 31 cm

D. 80 cm

Answer: C

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151. An organ pipe open at one end is vibrating in first overtone and is in resonance with another pipe open at both ends and vibrating in third harmonic. The ratio of length of two pipes is–

A. $3:8$

B. $8:3$

C. $1:2$

D. $4:1$

Answer: B

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152. 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. 50 Hz

B. 100 Hz

C. 200 Hz

D. 25 Hz

Answer: A

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153. A tuning fork of frequency 340 Hz is vibrated just above the tube of 120 cm height. Water is poured slowly in the tube. What is the minimum height of water necessary for the resonance? (speed of sound in the air = 340m/s)

A. 15 cm

B. 25 cm

C. 30 cm

D. 45 cm

Answer: A

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154. The third overtone of an open organ pipe of length l_0 has the same frequency as the third overtone of a closed pipe of length l_c. The ratio l_0 / l_c is equal to

A. 2

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

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

D. $\frac{8}{7}$

Answer: D

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155. A pipe of lengh $1m$ is closed at one end. The velocity sound in air is $300m/s$. The air column in the pipe will not resonate for sound of frequency

A. 75 Hz

B. 225 Hz

C. 300 Hz

D. 375 Hz

Answer: C

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156. A sonometer wire resonates with a given tuning fork forming a standing wave with five antinodes between the two bridges when a mass of $9kg$ is suspended from the wire. When this mass is replaced by a mass 'M' kg, the wire resonates with the same tuning fork forming three antinodes for the same positions of the bridges. Find the value of M.

A. 25 kg

B. 5 kg

C. 12.5 kg

D. $\frac{1}{25}kg$

Answer: D

Watch Video Solution

157. 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: B

Watch Video Solution

158. 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. 200 Hz

B. 300 Hz

C. 240 Hz

D. 480 Hz

Answer: B

Watch Video Solution

159. String A has a length L, radius of cross-section r, density of material p and is under tension T. String b has all these quantities double those of string A. If v_a and v_b are the corresponding fundamentals frequinces of the vibrating string,then

A. $v_A = 2v_B$

B. $v_A = 4v_B$

C. $v_B = 4v_A$

D. $v_A = v_B$

Answer: D

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160. Two pipes are each 50 cm in length. One of them is closed at one end while the other is open at both ends. The speed of sound in air is 340 m s^{-1}. The frequency at which both the pipes can resonate is

A. 680 Hz

B. 510 Hz

C. 85 Hz

D. none of these

Answer: A

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161. In a sonometer wire, the tension is maintained by suspending a 50.7 kg mass from the free end of the wire. The suspended mass has a volume of 0.0075 m 3. The fundamental frequency of the wire is 260 Hz . If the suspended mass is completely submerged in water, the fundamental frequency will become (take $g = 10ms^{-2}$)

[

A. 200 Hz

B. 220 Hz

C. 230 Hz

D. 240 Hz

Answer: B

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162. A wire of density $9 \times 10^3 kg/m^3$ is stretched between two clamps 1 m apart and is subjected to an extension of $4.9 \times 10^{-4} m$. The lowest frequency of transverse vibration in the wire is $(Y = 9 \times 10^{10} N/m^2)$

A. 38 Hz

B. 36 Hz

C. 35 Hz

D. 32 Hz

Answer: B

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163. The transverse displacement of a string fixed at both ends is given by $y = 0.06 \sin\left(\frac{2\pi x}{3}\right) \cos(100\pi t)$ where x and y are in metres and t is in seconds. The length of the string is 1.5 m and its mass is $3.0 \times 10^{-2} kg$. What is the tension in the string?

A. 225 N

B. 300 N

C. 450 N

D. 675 N

Answer: C

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164. A string that is stretched between fixed supports separated by 75.0 cm has resonant frequencies of 420 and 315 Hz, with no intermediate resonant frequencies. What is the lowest resonant frequency?

A. 250 Hz

B. 317 Hz

C. 180 Hz

D. 105 Hz

Answer: D

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165. A resonance pipe is open at both ends and 30 cm of its length is in resonance with an external frequency 1.1 kHz. If the speed of sound is 330 m/s which harmonic is in resonance

A. first

B. second

C. third

D. fouth

Answer: B

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166. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipes so obtained will be

A. $v_1 + v_2$

B. $\frac{v_1 v_2}{(v_1 + v_2)}$

C. $\frac{v_1 v_2}{v_1 - v_2}$

D. $\sqrt{(v_1^2 + v_2^2)}$

Answer: A

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167. If λ_1, λ_2 and λ_3 are the wavelengths of the wave giving resonance with the fundamental, first and second overtones respectively of a closed orga pipe Then the ratio of wavelength λ_1, λ_2 and λ_3 is

A. $1:3:5$

B. $1:2:3$

C. $5:3:1$

D. $1:\frac{1}{3}:\frac{1}{5}$

Answer: A

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168. A string of density $7.5 g cm^{-3}$ and area of cross - section $0.2 mm^2$ is stretched under a tension of 20 N. When it is plucked at the mid-point, the speed of the transverse wave on the wire is

A. $116 ms^{-1}$

B. $40 ms^{-1}$

C. $200 ms^{-1}$

D. $80 ms^{-1}$

Answer: A

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169. A wire stretched between two rigid supports vibrates in its fundamental mode with a frequency of 45 Hz. The mass of the wire is $3.5 \times 10^{-2} kg$ and its linear mass density is $4.0 \times 10^{-2} kgm^{-1}$. What is the speed of a transverse wave on the wire?

A. $69 ms^{-1}$

B. $79 ms^{-1}$

C. $89 ms^{-1}$

D. $99 ms^{-1}$

Answer: B

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170. A steel rod 100 cm long is clamped at its midpoint. The fundamental frequency of longitudinal vibrtions of the rod is 3 kHz. What is the speed of the sound in the rod?

A. $3 \times 10^3 ms^{-1}$

B. $4 \times 10^3 ms^{-1}$

C. $5 \times 10^3 ms^{-1}$

D. $6 \times 10^3 ms^{-1}$

Answer: D

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171. A tuning fork A produces 4 beats/ s with tuning fork, B of fequency 256 Hz. When the fork A is filled beats are found to occurs at shorter intervals, then the original frequency will be

A. 260 Hz

B. 252 Hz

C. 256 Hz

D. 258 Hz

Answer: C

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172. Two tuning forks A and B vibrating simultaneously produce $5 beats / s$. Frequency of B is $512 Hz$. If one arm of A is filed, the number of beats per second increases. Frequency of A is

A. 502 Hz

B. 507 Hz

C. 517 Hz

D. 522 Hz

Answer: B

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173. Two waves of wavelength 50 cm and 51 cm produce 12 beat/s . The speed of sound is

A. 340 m/s

B. 331 m/s

C. 306 m/s

D. 360 m/s

Answer: B

Watch Video Solution

174. 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. 95 Hz

B. 105 Hz

C. 100 Hz

D. 205 Hz

Answer: D

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175. A set of 24 tuning forks are so arranged that each gives 6 beats per second with the previous one. If the frequency of the last tuning fork is double that of the first, frequency of the second tuning fork is

A. 138 Hz

B. 144 Hz

C. 132 Hz

D. 276 Hz

Answer: B

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176. There are 26 tuning forks arranged in the decreasing order of their frequencies. Each tuning fork gives 3 beats with the next. The first one is octave of the last. What is the frequency of 18th tuning fork ?

A. 100 Hz

B. 99 Hz

C. 96 Hz

D. 103 Hz

Answer: A

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177. Two sitar strings A and B playing the note 'Ga' are slightly out of tune and produce beats of frequency 6 Hz. The tension in the string A is slightly reduced and the beat frequency is found to reduce to 3 Hz. If the original frequency of A is 324 Hz, what is the frequency of B?

A. 330 Hz

B. 318 Hz

C. 324 Hz

D. 321 Hz

Answer: D

Watch Video Solution

178. Two tuning forks have frequencies 450 Hz and 454 Hz respectively. On sounding these forks together, the time interval between successive maximum intensities will be

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

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

C. 1 s

D. $4s$

Answer: B

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179. When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of fork 2.

When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2 ?

A. 196 Hz

B. 204 Hz

C. 200 Hz

D. 202 Hz

Answer: A

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180. Whe two sound sources of the same amplitude but of slightly different frequencies υ_1 and υ_2 are sounded simultaneously, the sound one hears has a frequency equal to

A. $|v_1 - v_2|$

B. $\left[\frac{v_1 + v_2}{2}\right]$

C. $\sqrt{v_1 v_2}$

D. $[v_1 + v_2]$

Answer: D

View Text Solution

181. Two wires are fixed on a sonometer with their tensions are in the ratio 8:1, the length are in the ratio 36,35, the diameters in the ratio 4:1 and densities in the ratio 1:2. If the note of higher pitch has a frequency of 360Hz, then the frequency of other string will be

A. 5

B. 10

C. 15

D. 20

Answer: B

Watch Video Solution

182. The frequencies of two tuning forks A and B are respectively 1.5% more 2.5% less than that of tuning fork C. When A and B sounded together, 12 beats are produced in 1 second. The frequency of tuning fork C is

A. 200 Hz

B. 240 Hz

C. 360 Hz

D. 300 Hz

Answer: D

Watch Video Solution

183. The phenomenon of beats can take place

A. for longitudinal waves only

B. for transverse waves only

C. for sound waves only

D. for both longitudinal and transverse waves

Answer: B

Watch Video Solution

184. A closed organ pipe and an open organ pipe of same length produce 2beats when they are set into viberations simultaneously in their fundamental mode. The length of open organ pipe is now halved and of closed organ pipe is doubled, the nunber of beats produced wil be

A. 7

B. 4

C. 8

D. 2

Answer: C

Watch Video Solution

185. 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. 340

B. 330

C. 360

D. 320

Answer: D

Watch Video Solution

186. A source and an observer approach each other with same velocity 50 m/s. If the apparent frequency is 434

Hz, then the real frequency is (Given velocity of sound = 332 m/s)

A. 320 Hz

B. 360 Hz

C. 390 Hz

D. 420 Hz

Answer: A

Watch Video Solution

187. If a source of sound of frequency υ and a listener approach each other with a velocity equal to $(1/20)$ of velocity of sound, the apparent frequency heard by the listener is

A. $\left(\frac{21}{19}\right)v$

B. $\left(\frac{20}{21}\right)v$

C. $\left(\frac{21}{20}\right)v$

D. $\left(\frac{19}{20}\right)v$

Answer: A

Watch Video Solution

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

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

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

D. $\frac{1}{10}$

Answer: C

Watch Video Solution

189. 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. 750 Hz

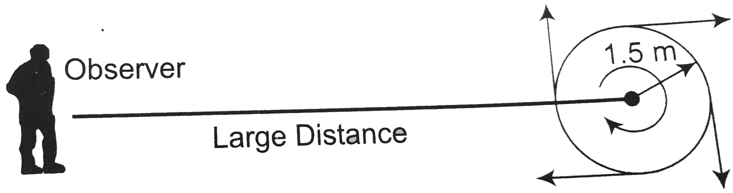
B. 857 Hz

C. 1143 Hz

D. 1333 Hz

Answer: D

Watch Video Solution

190. 

A whistle emitting a sound of frequency $440Hz$ 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. 400.0 Hz to 484.0 Hz

B. 403.3 Hz to 480.0 Hz

C. 400.0 Hz to 480.0 Hz

D. 403.3 Hz to 484.0 Hz

Answer: C

Watch Video Solution

191. A car sounding its horn at $480Hz$ moves towards a high wall at a speed of $20ms^{-1}$, the frequency of the reflected sound heard by the man sitting in the car will be nearest to , (speed of sound $= 330m/s$)

A. 480 Hz

B. 510 Hz

C. 540 Hz

D. 570 Hz

Answer: A

Watch Video Solution

192. A car is initially at rest, 330 m away from a stationary observer. It begins to move towards the observer with an acceleration of $1.1ms^{-2}$ sounding its horn continuously. 20 s later, the driver stops sounding the horn. The velocity of sound in air is $330ms^{-1}$. The observer will hear the sound of the horn for a duration of

A. 20 s

B. 21 s

C. $20\frac{2}{3}s$

D. $19\frac{1}{3}s$

Answer: C

Watch Video Solution

193. The apparent frequency of the whistle of an engine changes in the ratio 6:5 as the engine passes a stationary observer. If the velocity of sound is $330\frac{m}{s}$, then the velocity of the engine is

A. 40 m/s

B. 20 m/s

C. 340 m/s

D. 180 m/s

Answer: A

Watch Video Solution

194. A bat flies at a steady speed of $4ms^{-1}$ emitting 90 kHz sound waves and is flying towards a wall. It detects a reflected signal at a frequency (speed of sound is $340ms^{-1}$)

A. 90.2 kHz

B. 91.2 kHz

C. 92.2 kHz

D. 93.2 kHz

Answer: A

Watch Video Solution

195. 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. $30ms^{-1}$

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

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

D. $15ms^{-1}$

Answer: A

Watch Video Solution

196. 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 $340m/s$, then the ratio $f_1/f_2$is

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

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

C. 2

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

Answer: C

Watch Video Solution

197. A source of sound producing wavelength 50 cm is moving away from a stationary observer with $\left(\frac{1}{5}\right)^{th}$ speed of sound. Then what is the wavelength of sound received by the observer?

A. 55 cm

B. 40 cm

C. 60 cm

D. 70 cm

Answer: C

Watch Video Solution

198. 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: D

Watch Video Solution

199. Sound of freqeuncy 1000 Hz from a stationary source is reflectd form an object approaching the source is $30ms^{-1}$, back to a stationary observer located at the source. The speed of sound in a air is $330ms^{-1}$. The frequency of the sound heard by the observer is :

A. 1200 Hz

B. 1000 Hz

C. 1090 Hz

D. 1100 Hz

Answer: C

Watch Video Solution

200. An engine approaches a hill with a constant speed. When it is at a distance of 0.9 km, it blows a whistle whose echo is heard by the driver after 5 seconds. If the speed of sound in air is 330 m/s, then the speed of the engine is :

A. $30ms^{-1}$

B. $60ms^{-1}$

C. $32ms^{-1}$

D. $27.5ms^{-1}$

Answer: B

Watch Video Solution

1. The displacement of two particles executing SHM are represented by equations, $y_1 = 2\sin(10t + \theta)$, $y_2 = 3\cos 10t$. The phase difference between the velocity of these particles is

A. θ

B. $-\theta$

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

D. $\theta-\frac{\pi}{2}$

Answer: D

Watch Video Solution

2. The bob of a simple pendulum of length L is released at time t = 0 from a position of small angular displacement θ_0 . Its linear displacement at time t is given by :

A. $X = a \sin 2\pi \sqrt{\frac{L}{g}} \times t$

B. $X = a \cos 2\pi \sqrt{\frac{g}{L}} \times t$

C. $X = a \sin \sqrt{\frac{g}{L}} \times t$

D. $X = a \cos \sqrt{\frac{g}{L}} \times t$

Answer: D

Watch Video Solution

3. A horizontal platform with an object placed on it is executing S.H.M. in the vertical direction. The amplitude of oscillation is 3.92×10^{-3} m. what must ve the least period of these oscillations. So that the object is not detached from the platform

A. 0.1256 s

B. 0.1356 s

C. 0.1456 s

D. 0.1556 s

Answer: A

Watch Video Solution

4. A particle of mass m is executing osciallations about the origin on the x-axis with amplitude A. its potential energy is given as $U(x) = \alpha x^4$, where α is a positive constant. The x-coordinate of mass where potential energy is one-third the kinetic energy of particle is

A. $\pm \frac{A}{\sqrt{3}}$

B. $\pm \frac{A}{\sqrt{2}}$

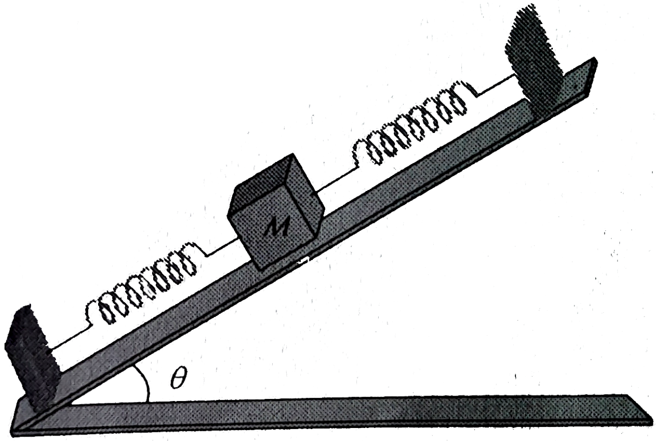
C. $\pm \frac{A}{3}$

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

Answer: B

Watch Video Solution

5. On a smooth inclined plane, a body of mass M is attached between two springs. The other ends of the springs are fixed to firm supports. If each spring has force constant K , the period of oscillation of the body (assuming the springs as massless) is



A. $2\pi[M/2k]^{1/2}$

B. $2\pi[2M/k]^{1/2}$

C. $2\pi[Mg\sin\theta/2k]^{1/2}$

D. $2\pi[2Mg/k]^{1/2}$

Answer: B

Watch Video Solution

6. In damped oscillations, the amplitude is reduced to one-third of its initial value a_0 at the end of 100 oscillations. When the oscillator completes 200 oscillations ,its amplitude must be

A. $a_0/2$

B. $a_0/6$

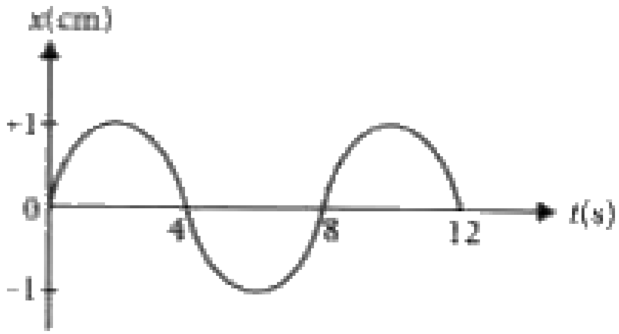
C. $a_0/9$

D. $a_0/4$

Answer: C

Watch Video Solution

7. The x-t graph of a particle undergoing SHM is as shown in figure. The acceleration of the particle at $t = 2/3$ is



A. $\frac{\sqrt{3}}{32}\pi^2 cms^{-2}$

B. $-\frac{\pi^2}{32} cms^{-2}$

C. $\frac{\pi^2}{32} cms^{-2}$

D. $-\frac{\sqrt{3}}{32}\pi^2 cms^{-2}$

Answer: B

Watch Video Solution

8. Two simple harmonic motions are represented by $y_1 = 5\left[\sin 2\pi t + \sqrt{3}\cos 2\pi t\right]$ and $y_2 = 5\sin\left(2\pi t + \frac{\pi}{4}\right)$

The ratio of their amplitudes is

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:\sqrt{3}$

Answer: C

Watch Video Solution

9. A particle is performing SHM along x-axis with amplitude 6.0 cm and time period 12 s. What is the minimum time taken by the particle to move from $x = +3cm$ to $x = +6cm$ and back again?

A. 1 s

B. 2 s

C. 4 s

D. 6 s

Answer: C

Watch Video Solution

10. Starting from the origin, a body oscillates simple harmonically with a period of 2 s. After what time will its kinetic energy be 25% of the total energy?

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

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

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

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

Answer: D

Watch Video Solution

11. Two linear SHM of equal amplitudes A and frequencies ω and 2ω are impressed on a particle along x and $y - axes$ respectively. If the initial phase difference between them is $\pi/2$. Find the resultant path followed by the particle.

A. $y^2 = x^2(1 - x^2/A^2)$

B. $y^2 = 2x^2(1 - x^2/A^2)$

C. $y^2 = 4x^2(1 - x^2/A^2)$

D. $y^2 = 8x^2(1 - x^2/A^2)$

Answer: C

Watch Video Solution

12. A particle, with restoring force proportional to displacement and resulting force proportional to velocity is subjected to a force $F \sin \omega t$. If the amplitude of the particle is maximum for $\omega = \omega_1$, and the energy of the particle is maximum for $\omega = \omega_2$, then

A. $\omega_1 = \omega_0$ and $\omega_2 \neq \omega_0$

B. $\omega_1 = \omega_0$ and $\omega_2 = \omega_0$

C. $\omega_1 \neq \omega_0$ and $\omega_2 = \omega_0$

D. $\omega_1 \neq \omega_0$ and $\omega_2 \neq \omega_0$

Answer: C

Watch Video Solution

13. A simple pendulum has a length l. The inertial and gravitational masses of the bob are m_i and m_g, respectively. Then, the time period T is given by

A. $T = 2\pi\sqrt{\frac{m_g l}{m_i g}}$

B. $T = 2\pi\sqrt{\frac{m_i l}{m_g g}}$

C. $T = 2\pi\sqrt{\frac{m_i \times m_g \times l}{g}}$

D. $T = 2\pi\sqrt{\frac{l}{m_i \times m_g \times g}}$

Answer: B

Watch Video Solution

14. 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. standing wave of frequency $(1/\sqrt{b})$

B. wave moving in $+X$ direction with speed $\left(\sqrt{a/b}\right)$

C. wave moving in $-X$ direction with speed $\left(\sqrt{b/a}\right)$

D. standing wave of frequency $(\sqrt{b})$

Answer: C

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15. A sonometer wire of length $1.5m$ is made of steel. The tension in it produces an elastic strain of 1%. What is the fundamental frequency of steel if density and elasticity of steel are $7.7 \times 10^3 kg/m^3$ and $2.2 \times 10^{11} N/m^2$ respectively?

A. 178.2 Hz

B. 200.5 Hz

C. 770.7 Hz

D. 188.5 Hz

Answer: A

Watch Video Solution

16. The phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is 0.5π . The wave velocity is

A. $144ms^{-1}$

B. $384ms^{-1}$

C. $256ms^{-1}$

D. $720ms^{-1}$

Answer: B

Watch Video Solution

17. A wire under tension vibrates with a frequency of 450Hz. What would be the fundamental frequency, if the wire were half as long, twice as thick and under one fourth tension ?

A. 225 Hz

B. 190 Hz

C. 247 Hz

D. 174 Hz

Answer: A

Watch Video Solution

18. Equation of a stationary wave is $y = 10\sin\left(\frac{\pi x}{4}\right)\cos 20\pi t$ Distance between two consecutive nodes is

A. 4

B. 2

C. 1

D. 8

Answer: A

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19. the speed of sound in hydrogen at NTP is 1270m/s. then the speed in m/s in a mixture of hydrogen and oxygen in the ratio 4:1 by volume will be

A. $317ms^{-1}$

B. $830ms^{-1}$

C. $635ms^{-1}$

D. $950ms^{-1}$

Answer: C

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20. An object of specific gravity ρ is hung from a thin copper wire. The fundamental frequency for transverse standaing waves in the wire is 400 Hz. The object is immersed in water so that one third of its volume is submerged. What is the new fundamental frequency?

A. $200\sqrt{\frac{\rho-1}{3\rho}}Hz$

B. $400\sqrt{\frac{3\rho-1}{3\rho}}Hz$

C. $400\sqrt{\frac{\rho-1}{3\rho}}Hz$

D. $200\sqrt{\frac{3\rho-1}{3\rho}}Hz$

Answer: B

Watch Video Solution

21. A closed organ pipe has fundamental frequency 100Hz. What frequencies will be produced, if its other ends is also opend ?

A. 200, 400, 600, 800..

B. 200, 300, 400, 500...

C. 100, 300, 500, 700...

D. 100, 200, 300, 400...

Answer: A

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22. A bus is moving with a velocity of $5ms^{-1}$ towards a huge wall. The driver sound a horn of frequency 165 Hz. If the speed of sound in air is $335ms^{-1}$, the number of beats heard per second by a passenger inside the bus will be

A. 3

B. 4

C. 5

D. 6

Answer: C

Watch Video Solution

23. A string is under tension so that its length is increased by $1/n$ times its original length . The ratio of fundamental frequency of longitudinal vibrations and transverse vibrations will be

A. $1:n$

B. $n^2:1$

C. $\sqrt{n}:1$

D. $n:1$

Answer: C

Watch Video Solution

24. A source of sound gives 5 beats when sounded with another source of frequency 100 Hz. The second harmonic of the source together with a source of frequency 200 Hz gives 10 beats s^{-1}. What is the frequency of the source?

A. 105 Hz

B. 205 Hz

C. 90 Hz

D. 100 Hz

Answer: A

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25. A transverse wave is described by the equation

$$y = y_0 \sin 4\pi\left(vt - \frac{x}{\lambda}\right).$$

The maximum particle velocity is equal to four times the wave velocity if

A. $\lambda = \pi y_0 / 4$

B. $\lambda = 2\pi y_0$

C. $\lambda = \pi / y_0$

D. $\lambda = \pi y_0$

Answer: D

Watch Video Solution

1. The displacement of a particle along the x- axis it given by $x = a\sin^2 \omega t$ The motion of the particle corresponds to

A. simple harmonic motion of frequency ω / π

B. simple harmonic motion of frequency $3\omega / 2\pi$

C. non simple harmonic motion

D. simple harmonic motion of frequency $\omega / 2\pi$

Answer: C

Watch Video Solution

2. The period of oscillation of mass M suspended from a spring of negligible mass is T. If along with it another mass M is also suspended, the period of oscillation will now be

A. T

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

C. 2T

D. $\sqrt{2}T$

Answer: D

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3. Out of the following functions representing motion of a particle which represents SHM

I. $y = \sin \omega t - \cos \omega t$

II. $y = \sin^3 \omega t$

III. $y = 5 \cos\left(\frac{3\pi}{4} - 3\omega t\right)$

IV. $y = 1 + \omega t + \omega^2 t^2$

A. Only 1

B. Only (4) does not represent SHM

C. Only (1) and (3)

D. Only (1) and (2)

Answer: C

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4. Two pearticle are oscillation along two close parallel straght lines side by side with the same frequency and amplitude They pass each other moving in opposite directions when their displacement is half of the on a stright line perpendicular to the part of the two particle The phase difference is

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

B. 0

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

D. π

Answer: C

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5. The oscillation of a body on a smooth horizontal surface is represented by the equation,

$X = A\cos(\omega t)$

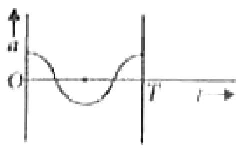
where, X = displacement at time t

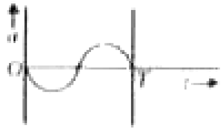
$\omega =$ frequency of oscillation

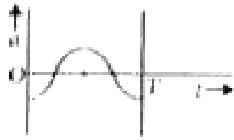
Which one of the following graphs shows correctly the variation a with t?

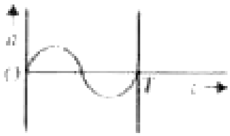
Here, a = acceleration at time t

T = time period

A. 

B. 

C. 

D. 

Answer: C

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6. A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are v_1 and v_2, respectively. Its time period is

A. $2\pi\sqrt{\frac{V_1^2 + V_2^2}{x_1^2 + x_2^2}}$

B. $2\pi\sqrt{\frac{V_1^2 + V_2^2}{x_1^2 - x_2^2}}$

C. $2\pi\sqrt{\frac{x_1^2 + x_2^2}{V_1^2 + V_2^2}}$

D. $2\pi\sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}}$

Answer: D

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7. when two displacements represented by $y_1 = a\sin(\omega t)$ and $y_2 = b\cos(\omega t)$ are superimposed the motion is

A. simple harmonic with amplitude $\sqrt{a^2 + b^2}$

B. simple harmonic with amplitude $\frac{(a+b)}{2}$

C. not a simple harmonic

D. simple harmonic with amplitude $\frac{a}{b}$

Answer: A

Watch Video Solution

8. A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3s.

When the mass m is increased by $1kg$, the time period of oscillations becomes 5s. The value of m in kg is

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

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

C. $\frac{16}{9}$

D. $\frac{9}{16}$

Answer: D

Watch Video Solution

9. A spring of force constant k is cut into lengths of ratio $1:2:3$. They are connected in series and the new force constant is k'. Then they are connected in parallel and force constant is k'. Then k' : k" is :

A. $1:9$

B. $1:11$

C. $1:14$

D. $1:6$

Answer: B

Watch Video Solution

10. A particle executes linear simple harmonic motion with an amplitude of $3cm$. When the particle is at $2cm$ from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then, its time period in seconds is

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

B. $\frac{4\pi}{\sqrt{5}}$

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

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

Answer: B

Watch Video Solution

11. A pendulum is hung the roof of a sufficiently high huilding and is moving freely to and fro like a simple harmonic oscillator .The acceleration of the bob of the pendulum is $20m/s^2$ at a distance of $5m$ from the meanposition .The time period of oscillation is

A. $2\pi s$

B. πs

C. $2s$

D. $1s$

Answer: B

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12. The diplacement of a particle executing simple harmonic motion is given by

$y = A_0 + A\sin\omega t + B\cos\omega t$. Then the amplitude of its oscillation is given by

A. $A + B$

B. $A_0 + \sqrt{A^2 + B^2}$

C. $\sqrt{A^2 + B^2}$

D. $\sqrt{A_0^2 + (A + B)^2}$

Answer: C

Watch Video Solution

13. Average velocity of a particle executing SHM in one complete vibration is :

A. zero

B. $\frac{A\omega}{2}$

C. $A\omega$

D. $\frac{A\omega^2}{2}$

Answer: A

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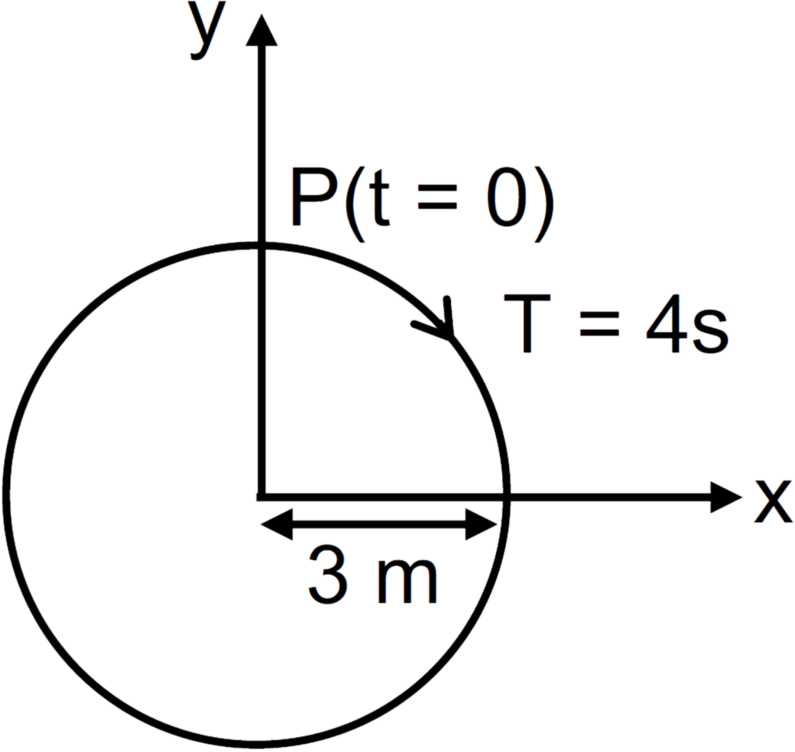
14. The radius of cirlcue, the period of revolution, initial position and sense of revolution are indicated in the figure.



y-projection of the radius vector of rotating particle P is :

A. $y(t) = 3\cos\left(\frac{\pi t}{2}\right)$, where y inm

B. $y(t) = -3\cos 2\pi t$, where y in m

C. $y(t) = 4\sin\left(\frac{\pi t}{2}\right)$, where y in m

D. $y(t) = 3\cos\left(\frac{3\pi t}{2}\right)$, where y in m

Answer: A

Watch Video Solution

15. 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

16. 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

17. 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 metres and t is in seconds. The phase difference between them is

A. 1.0 radian

B. 1.25 radian

C. 1.57 radian

D. 0.57 radian

Answer: A

Watch Video Solution

18. 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. decreases by a factor 10

B. increase by a factor 20

C. increase by a factor 10

D. decrease by a factor 20

Answer: C

Watch Video Solution

19. 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. 0.01

B. 0.02

C. 0.03

D. 0.04

Answer: B

Watch Video Solution

20. When a string is divided into three segments of lengths l_1, l_2 and l_3 the fundamental frequencies of these three segments are v_1, v_2 and v_3 respectively. The original fundamental frequency (v) of the string is

A. $\sqrt{v} = \sqrt{v_1} + \sqrt{v_2} + \sqrt{v_3}$

B. $v = v_1 + v_2 + v_3$

C. $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

D. $\frac{1}{\sqrt{v}} = \frac{1}{\sqrt{v_1}} + \frac{1}{\sqrt{v_2}} + \frac{1}{\sqrt{v_3}}$

Answer: C

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21. Two sources of sound placed closed 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 $25:16$ between waxing and waning

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

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

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

Answer: D

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22. The equation of a simple harmonic wave is given by

$$y = 3\sin\frac{\pi}{2}(50t - x)$$

where x and y are in meters and x is in second .The ratio of maximum particle velocity to the wave velocity is

A. 2π

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

C. 3π

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

Answer: B

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23. 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. 3500 Hz

B. 4000 Hz

C. 5000 Hz

D. 3000 Hz

Answer: C

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

A. All harmonics of the fundamental frequency will be generated

B. Pressure change will be maximum at both ends

C. Open end will be antinode

D. Odd harmonics of the fundamental frequency will be generated

Answer: B

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25. 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

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26. 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. 240 Hz

B. 260 Hz

C. 254 Hz

D. 246 Hz

Answer: C

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27. If $n_1, n_2 \text{and} n_3$ 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

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28. 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

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29. 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. 1332 Hz

B. 1372 Hz

C. 1412 Hz

D. 1454 Hz

Answer: C

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30. 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. 120 cm

B. 140 cm

C. 80 cm

D. 100 cm

Answer:

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

A. 10.5 Hz

B. 105 Hz

C. 155 Hz

D. 205 Hz

Answer:

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32. A particle is executing a simple harmonic motion. Its maximum acceleration is α and maximum velocity is β. Then, its time period of vibration will be

A. $\frac{\beta^2}{\alpha}$

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

C. $\frac{\beta^2}{\alpha^2}$

D. $\frac{\alpha}{\beta}$

Answer:

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33. $4.0g$ of a gas occupies 22.4 litres at NTP. The specific heat capacity of the gas at constant volume is $5.0JK^{-1}mol^{-1}$. If the speed of sound in this gas at NTP is $952ms^{-1}$. Then the heat capacity at constant pressure is

A. $7.0JK^{-1}mol^{-1}$

B. $8.5JK^{-1}mol^{-1}$

C. $8.0JK^{-1}mol^{-1}$

D. $7.5JK^{-1}mol^{-1}$

Answer:

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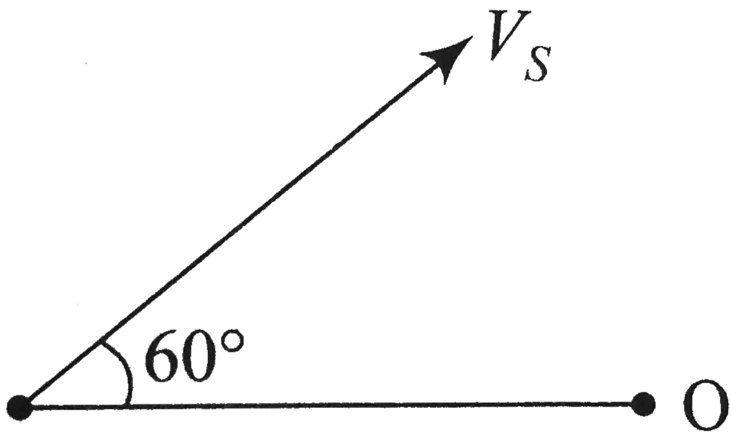

34.

A source of sound S emitting waves of frequency $100Hz$ and an observer O are located at some distance from each other. The source is moving with a speed of $19.4ms^{-1}$ 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. 106 Hz

B. 97 Hz

C. 100 Hz

D. 103 Hz

Answer:

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35. 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. 838 Hz

B. 885 Hz

C. 765 Hz

D. 800 Hz

Answer:

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

A. 150 cm

B. 200 cm

C. 66.7 cm

D. 100 cm

Answer:

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37. A uniform rope of legnth 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. $\sqrt{\frac{m_2}{m_1}}$

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

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

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

Answer:

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38. 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. L

B. 2L

C. $L/2$

D. 4L

Answer:

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39. Three sound waves of equal amplitudes have frequencies (n-1) ,n (n+1) .They superimpose to give beats.The number of beats produced per second will be

A. 1

B. 4

C. 3

D. 2

Answer:

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40. 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. 20 Hz

B. 30 Hz

C. 40 Hz

D. 10 Hz

Answer:

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41. 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 $400Hz$. The frequency heard by the driver of the second car is [velocity of sound $340m/s$].

A. 361 Hz

B. 411 Hz

C. 448 Hz

D. 350 Hz

Answer:

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42. 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. $330ms^{-1}$

B. $339ms^{-1}$

C. $350ms^{-1}$

D. $300ms^{-1}$

Answer:

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43. 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. 13.2 cm

B. 8 cm

C. 12.5 cm

D. 16 cm

Answer:

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