doubtnut
India's Number 1 Education App

PHYSICS

BOOKS - MTG-WBJEE PHYSICS (HINGLISH)

OSCILLATIONS AND WAVES

Wb Jee Workout Category 1 Single Opton Correct Type 1 Mark

1. If the length of a simple pendulum is increased by 2%, then the time period

A. increases by 1%

B. decreases by 1%

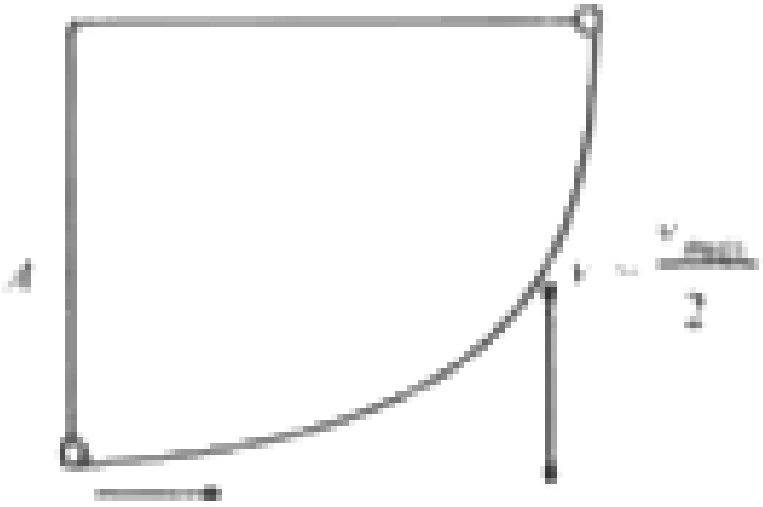
C. increases by 2%

D. decreases by 2%

Answer: A

View Text Solution

2. A particle starts with S.H.M. from the mean position as shown in the figure. Its amplitude is A and its time period is T. At any instant, its speed is half that of the maximum speed. What is the displacement of the particle at the that point?



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

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

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

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

Answer: D

View Text Solution

3. The bob of simple pendulum having length 1, is displaced from mean position to an angular position o with respect to vertical. If it

is released, then velocity of bob at equilibrium position is

A. $\sqrt{2g(1-\cos\theta)}$

B. $\sqrt{2g(1+\cos\theta)}$

C. $\sqrt{2gl\cos\theta}$

D. $\sqrt{2gl}$

Answer: A

View Text Solution

4. When an oscillator completes 100 oscillations its amplitude reduced to 1/3 of initial value. What will be its amplitude, when it completes 200 oscillations?

A. $1/8$

B. $2/3$

C. $1/6$

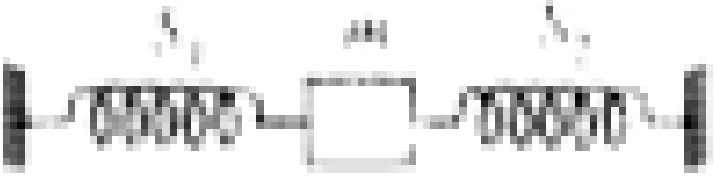
D. $1/9$

Answer: D

View Text Solution

View Text Solution

5. In the figure S_1 and S_2 are identical springs. The oscillation frequency of the mass m is f. If one spring is removed, the frequency will become



A. f

B. $f/\sqrt{2}$

C. $f \times 2$

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

Answer: B

View Text Solution

6. 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 T_2/T_1 is

A. 1

B. $\sqrt{2}$

C. 4

D. 2

Answer: D

View Text Solution

7. The displacemeent of a particle is given at time t by $x = A\sin(-2\omega t) + B\sin^2\omega t.$ Then,

A. the motion of the particle is SHM with an amplitude of $\sqrt{A^2 + \frac{B^2}{4}}$

B. the motion of the particle is not SHM, but oscillatory with a time period of $T = \frac{\pi}{\omega}$.

C. the motion of the particle is oscillatory with a time period of $T = \frac{\pi}{2\omega}$.

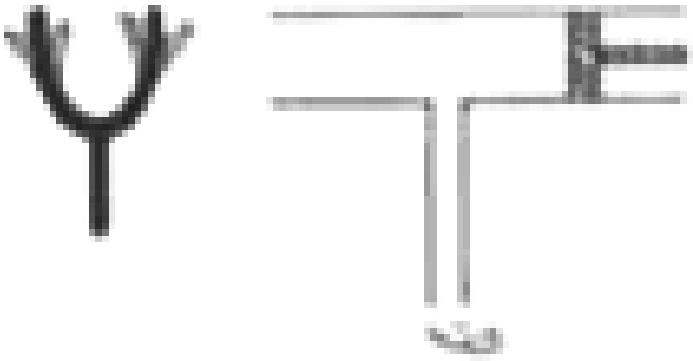
D. the motion of the particle is a not periodic

Answer: A

View Text Solution

8. Vibrating tuning fork of frequency v is placed near the open end of a long cylindrical tube. The tube has a side opening and is fitted with a movable reflecting piston. As the piston is moved through 8.75 cm, the intensity of sound changes from a maximum to minimum,

if the speed of sound is 350 m/s. Then v is



A. 500 Hz

B. 1000 Hz

C. 2000 Hz

D. 4000 Hz

Answer: B

View Text Solution

9. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The operating frequency of the scanner is 4.2 MHz. The speed of sound in a tissue is 1.7 km/s. The wavelength of sound in the tissue is close to

A. 4×10^{-3} m

B. 8×10^{-3}m

C. 4×10^{-4} m

D. 8×10^{-4} m

Answer: C

View Text Solution

10. A transverse wave is represented by the equation $y = y\frac{\sin(2\pi)}{\lambda}(vt - x)$ For what value of λ , is the maximum particle velocity equal to two times the wave velocity?

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

B. $\lambda = \frac{\pi y_0}{3}$

C. $\lambda = 2\pi y_0$

D. $\lambda = \pi y_0$

Answer: D

View Text Solution

11. Two stationary sources each emitting waves of wavelength λ , an observer moves from one source to another with velocity u. Then number of beats heard by him is

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

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

C. $\sqrt{u\lambda}$

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

Answer: A

View Text Solution

12. A wave travelling in positive x-direction with a=0.2 m/s. Velocity = 360 m/s. and λ = 60 m, then correct expression for the wave is

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

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

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

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

Answer: C

View Text Solution

13. Two vibrating tuning forks produce waves given by $y_1 = 4 \sin 500\pi t$ and $y_2 = 2 \sin 506\pi t$. Number of beats produced per minute is

A. 360

B. 180

C. 60

D. 3

Answer: B

View Text Solution

14. Two springs are joined and attached to a mass of 16 kg. The system is then suspended vertically from a rigid support. The spring

constant of the two springs are K_1 and K_2 respectively. The period of vertical oscillations of the system will be:

A. $\frac{1}{8\pi}\sqrt{K_1+K_2}$

B. $8\pi\sqrt{\frac{K_1+K_2}{K_1K_2}}$

C. $\frac{\pi}{2}\sqrt{K_1-K_2}$

D. $\frac{\pi}{2}\sqrt{\frac{K_1}{K_2}}$

Answer: B

View Text Solution

15. The equation of a progressive wave can be given by $y = 15\sin(660\pi t - 0.02\pi x)$ cm. The frequency of the wave is

A. 330 Hz

B. 342 Hz

C. 365 Hz

D. 660 Hz

Answer: A

View Text Solution

16. Two stretched strings have lengths 1 and 21 while tensions are T and 4 T respectively. If they are made of same material the ratio of their frequency is

A. $2:1$

B. $1:2$

C. $1:1$

D. $1:4$

Answer: C

View Text Solution

17. When sound is produced in an aeroplane with a velocity of 200 m/s horizontally its echo is heard after $10\sqrt{5}$ seconds. If velocity of sound in air is 300 ms^{-1} the elevation of aircraft is

A. 250 m

B. $250\sqrt{5}$ m

C. 1250 m

D. 2500 m

Answer: D

View Text Solution

18. Two turning forks of frequencies n_1 and n_2 produces n beats per second. If n_2 and n are known, n_1 , may be given by

A. $\frac{n_2}{n} + n_2$

B. $n_2 n$

C. $n_2 \pm n$

D. $\frac{n_2}{n} - n_2$

Answer: C

View Text Solution

19. A car moving with a velocity of 36 km/h crosses a siren of frequency 500 Hz. The apparent frequency of siren after passing it will be

A. 530 Hz

B. 485 Hz

C. 540 Hz

D. 460 Hz

Answer: B

View Text Solution

20. The function $\sin^2(\omega t)$ represents

A. a periodic, but not simple harmonic motion with period $2\pi/\omega$

B. a periodic, but not simple harmonic motion with period π/ω

C. a simple harmonic motion with a period

$2\pi / \omega$

D. a simple harmonic motion with a period

π / ω

Answer: B

View Text Solution

21. A spring of force constant k is cut into three equal parts. The force constant of each part would be

A. k/3

B. 3k

C. k

D. 2k

Answer: B

View Text Solution

22. A particle is executing linear simple harmonic motion of amplitude A. At what

displacement is the energy of the particle half potential and half kinetic?

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

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

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

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

Answer: C

View Text Solution

23. The equation of a progressive wave is $y = 4\sin\left(4\pi t - 0.04x + \frac{\pi}{3}\right)$ where x is in meter and t is in second. The velocity of the wave is

A. $100\pi m/s$

B. $50\pi m/s$

C. $25\pi m/s$

D. $\pi m/s$

Answer: A

View Text Solution

View Text Solution

24. The period of oscillation of a simple pendulum of length / suspended from the roof of a vehicle, which moves without friction down an inclined plane of inclination α , is given by

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

B. $2\pi\sqrt{\frac{l}{g\sin\alpha}}$

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

D. $2\pi\sqrt{\frac{l}{g\tan\alpha}}$

Answer: A

View Text Solution

25. The displacement of a particle in S.H.M. 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

View Text Solution

26. A plane progressive wave is given by, $y = 2\cos 6.284(330t - x)$. What is the period of wave?

A. $\frac{1}{330}s$

B. $2\pi \times 330s$

C. $(2\pi \times 330)^{-1} s$

D. 1

Answer: A

View Text Solution

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

A. $\pi/6$

B. $\pi/3$

C. $\pi/2$

D. $2\pi/3$

Answer: B

View Text Solution

28. The frequency of the first overtone of a closed pipe of length l_1 is equal to that of the first overtone of an open pipe of length l_1 . The ratio of their lengths $(l_1 : l_2)$ is

A. $2:3$

B. $4:5$

C. $3:5$

D. $3:4$

Answer: D

View Text Solution

29. Atrain approaching a railway platform with a speed of 20 ms^{-1} starts blowing the whistle. Speed of sound in air is 340 ms^{-1} . If

the frequency of the emitted sound from the whistle is 640 Hz, the frequency of sound to a person standing on the platform will appear to be

A. 600 Hz

B. 640 Hz

C. 680 Hz

D. 720 Hz

Answer: C

View Text Solution

30. The first and second resonating lengths of a resonance tube are 17 cm and 55 cm. The end-correction is given by

A. 1.7 cm

B. 2 cm

C. 5.5 cm

D. 7.2 cm

Answer: B

View Text Solution

Wb Jee Workout Category 2 Single Option Correct Type 2 Marks

1. A rectangular block of mass m and area of cross section A floats in a liquid of density ρ. If it is given a small vertical displacement from equilibrium it undergoes with a time period T, then

A. $T \propto \frac{1}{\sqrt{m}}$

B. $T \propto \sqrt{\rho}$

C. $T \propto \frac{1}{\sqrt{A}}$

D. $T \propto \frac{1}{\rho}$

Answer: C

View Text Solution

2. A hollow cylinder with both sides open generates a frequency fin air. When the cylinder vertically immersed into water by half its length the frequency will be

A. f

B. 2f

C. $f/2$

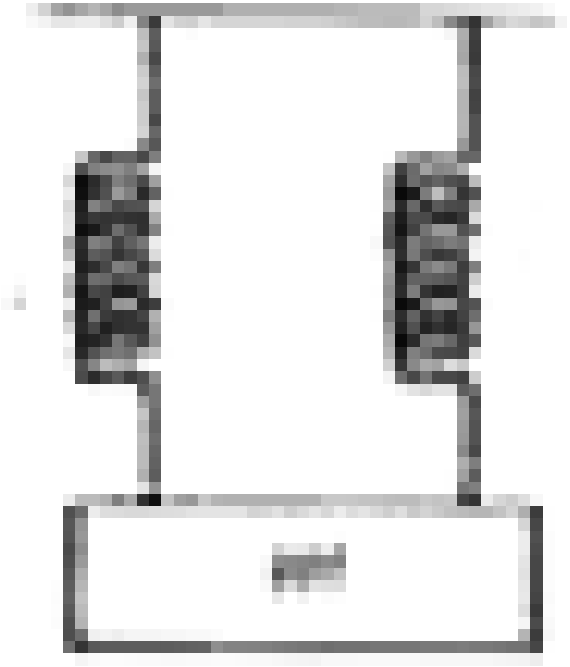
D. $f/4$

Answer: A

View Text Solution

3. A mass is suspended separately by two different springs in successive order then time periods is t_1 and t_2 respectively. If it is

connected by both spring as shown in figure then time period is to, 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. $t_0^{-1} = t_1^{-1} + t_2^{-1}$

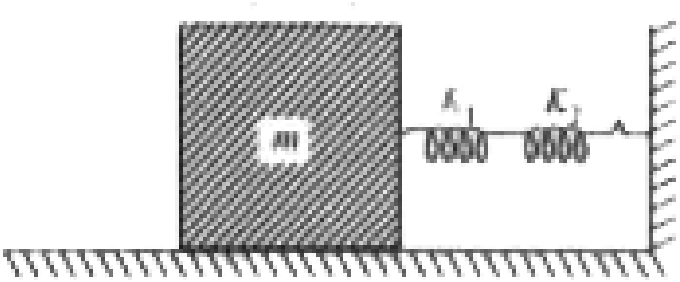
D. $t_0 = t_1 + t_2$

Answer: B

View Text Solution

4. Two springs are joined and connected to mass m as shown. If the springs separately have force constants K_1 and K_2 , then

frequency of oscillation of mass m is



A. $\frac{1}{2\pi}\sqrt{\frac{K_1K_2}{(K_1+K_2)m}}$

B. $2\pi\frac{\sqrt{(K_1+K_2)m}}{K_1K_2}$

C. $2\pi\sqrt{\frac{K_1K_2}{m}}$

D. $\frac{1}{2\pi}\sqrt{\frac{m}{K_1+K_2}}$

Answer: A

View Text Solution

5. A particle in simple harmonic motion is described by the displacement function $x(t) = A\cos(\omega t + \theta)$. If the initial (t = 0) position of the particle is 1 cm, its initial velocity is it cm/s, and its angular speed is π radian per second then its amplitude is

A. 1 cm

B. $\sqrt{2}$ cm

C. 2 cm

D. 2.5 cm

Answer: B

View Text Solution

6. A particle of mass m is attached to three identical massless springs of spring constant k as shown in the m 135 figure. The time period

of vertical oscillation of the particle is

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

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

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

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

Answer: B

View Text Solution

7. A longitudnal wave is represented by $x = x_0 \sin 2\pi\left(nt - \frac{x}{\lambda}\right)$. The maximum particle velocity will be four times the wave velocity if

A. $\lambda = \frac{\pi x_0}{4}$

B. $\lambda - 2\pi x_0$

C. $\lambda = \frac{\pi x_0}{2}$

D. $\lambda = 4\pi x_0$

Answer: C

View Text Solution

8. The point of suspension λ of a simple pendulum with normal time perid T_1 is moving upward according to equation

$y = kt^2$ where $k = 1m/s^2$. If new time period is T^2 the ratio $\frac{T_1^2}{T_2^2}$ will be

A. $2/3$

B. $5/6$

C. $6/5$

D. $3/2$

Answer: C

View Text Solution

9. When two progressive waves of intensity I_1 and I_2 , but slightly different frequencies superpose, the resultant intensity fluctuates between

A. $\left(\sqrt{I_1}+\sqrt{I_2}\right)^2$ and $\left(\sqrt{I_1}-\sqrt{I_2}\right)^2$

B. I_1+I_2 and $\left(\sqrt{I_1-\sqrt{I_2}}\right)$

C. (I_1+I_2) and $\sqrt{I_1-I_2}$

D. $\frac{I_1}{I_2}$ and $\frac{I_2}{I_1}$

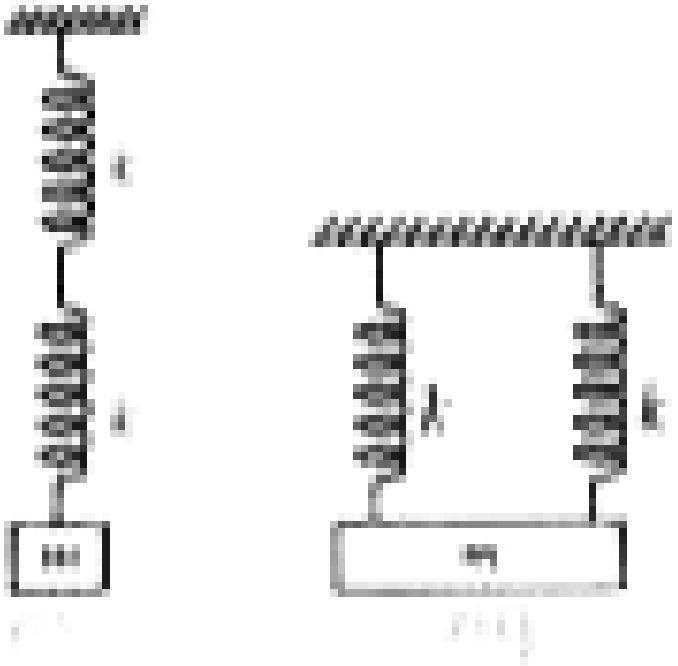
Answer: A

View Text Solution

View Text Solution

10. Two identical springs are connected to mass m as shown (k = spring constant). If the period of the configuration (i) is 2 s, the period

of the configuration (ii) is



A. $\sqrt{2s}$

B. 1s

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

D. $2\sqrt{2}s$

Answer: B

View Text Solution

11. A transverse wave propagating along x-axis is represented by $y(x, t) = 8.0\sin(0.5\pi - 4\pi t - \pi/4)$ 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. $\pi/4$ m/s.

Answer: A

View Text Solution

12. The phase difference between two waves, represented by

$y_1 = 10^{-6}\sin[100t + (x/50) + 0.5]m$

$y_2 = 10^{-6}\cos[100t + (x/50)]m$

where x is expressed in metres and t is expressed in seconds, is approximately.

A. 1.07 radians

B. 2.07 radians

C. 0.5 radians

D. 1.5 radians

Answer: A

View Text Solution

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

A. $v/\sqrt{2}$

B. $v/3$

C. $v/4$

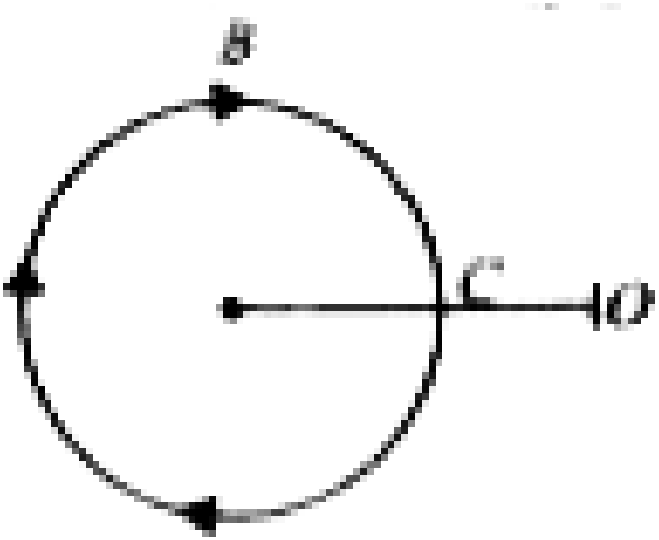
D. $v/2$

Answer: B

View Text Solution

14. A small source of sound moves on a circle as shown in the figure and an observer is sitting on O. Let n_1, n_2 and nz be the frequencies heard when the source is at A, B

and C respectively, then



A. $n_1 > n_2 > n_3$

B. $n_2 > n_3 > n_1$

C. $n_1 = n_2 > n_3$

D. $n_2 > n_1 > n_3$

Answer: B

View Text Solution

15. If in an experiment for determination of velocity of sound by resonance tube method using a tuning fork of 512 Hz, first resonance was observed at 30.7 cm and second was obtained at 63.2 cm, then maximum possible error in velocity of sound is

A. 204.8 cm/sec

B. 102.4 cm/sec

C. 51.2 cm/sec

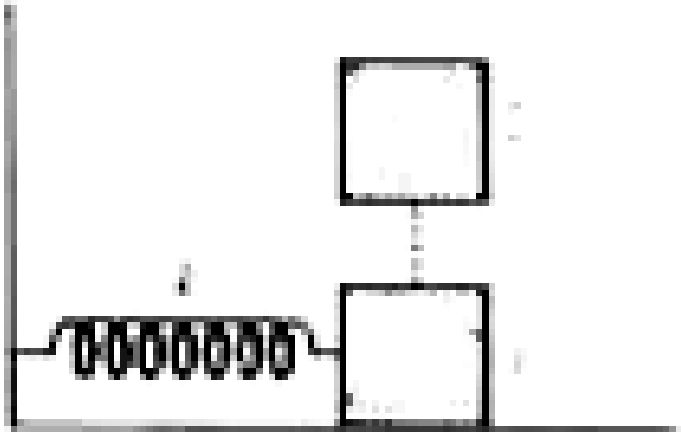
D. 161.3 cm/sec

Answer: C

View Text Solution

Wb Jee Workout Category 3 One Or More Than One Option Correct Type 2 Marks

1. An object of mass m is performing simple harmonic motion on a smooth horizontal surface as shown in figure. Just as the oscillating object reaches its extreme position, another object of mass 2m is dropped on it, which sticks to it. For this situation, mark out the correct statement(s).



A. Amplitude of oscillation remains unchanged.

B. Time period of oscillation remains unchanged.

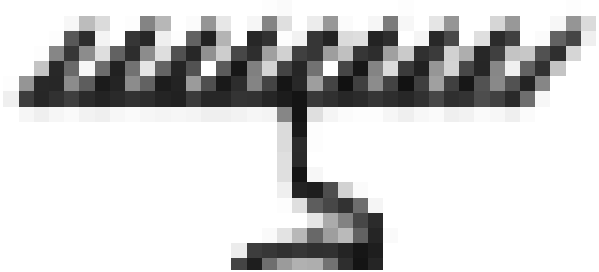
C. The total mechanical energy of the system does not change.

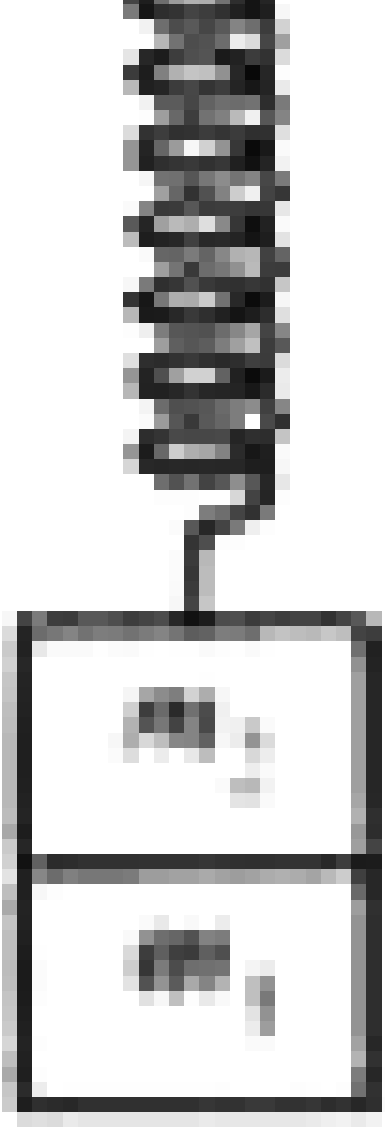
D. The maximum speed of the oscillating object changes.

Answer: A::C::D

View Text Solution

2. Two masses m_1 and m_2 are suspended w together by a light spring of spring constant k as shown in figure. When the system is in equilibrium, the mass m_1 is removed without disturbing the system. As a result of this removal, mass m_2 performs simple harmonic motion. For this situation mark the correct statement(s).





A. The amplitude of osciallation is $\frac{m_1 g}{k}$

B. The amplitude of oscillations is $\frac{(m_1 + m_2)g}{k}$

C. The system oscillates with angular frequency $\sqrt{\frac{k}{m_2}}$

D. The system oscillates with angular frequency $\sqrt{\frac{k}{m_1 + m_2}}$

Answer: A::C

View Text Solution

3. A whistle revolves in a circle with angular speed 0 = 20 rad/sec using a string of length 50 cm. If the frequency of sound from the whistle is 385 Hz, then what is the minimum frequency heard by an observer which is far away from the centre? (velocity of sound = 340 m/s)

A. 385 Hz

B. 374 Hz

C. 394 Hz

D. 333 Hz

Answer: B

View Text Solution

4. The equation of a transverse wave travelling along a spring is $y = 4.0 \sin \pi (2.0t - 0.010x)$, where y and x are in cm and t in second

A. Amplitude , a=4 cm, wavelength $\lambda = 200cm$ and frequency of the wire

$v = 1s^{-1}$

B. The initial phase at the origin is 180°

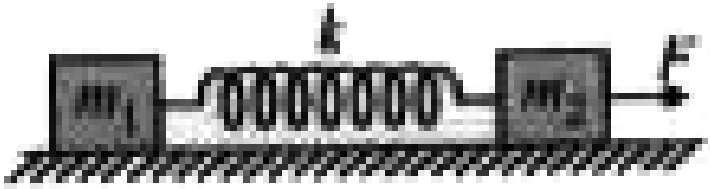
C. The phase difference between two positions of the same particle at a time interval of 0.50 second is 180°

D. None of these

Answer: A::C

View Text Solution

5. Two blocks connected by a spring rest on a smooth ITIM horizontal plane as shown in figure. A constant force F starts acting on block m_2 as shown in the figure. Which of the following statements are not correct?



A. Length of the spring increases continuously if $m_1 > m_2$

B. Blocks start performing SHM about centre of mass of the system, which moves rectilinearly with constant acceleration.

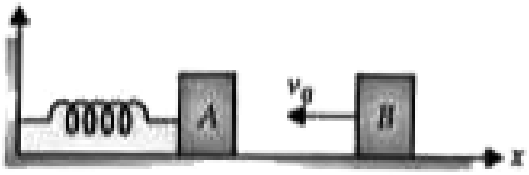
C. Blocks start performing oscillations about centre of mass of the system with increasing amplitude.

D. Acceleration of my is maximum at initial moment of time only.

Answer: A::C::D

View Text Solution

6. A block A of mass m connected with a spring of force constant k is executing SHM. The displacement time equation of the block is $x = x_0 + a \sin \omega t$. An identical block B moving towards negative x-axis with velocity vo collides elastically with block A at time t = 0. Then,



displacement time equation of A after collision will

A. displacement time equation of A after collision will be $x = x_0 - v_0\sqrt{\frac{m}{k}}\sin\omega t$

B. displacement time equation of A after collision will be $x = x_0 + v_0\sqrt{\frac{m}{k}}\sin\omega t$

C. velocity of B just after collision will be aw towards positive x-direction.

D. velocity of B just after collision will be vo towards positive x-direction.

Answer: A::C

View Text Solution

7. The ratio of the densities of oxygen and nitrogen is 16:14. At what temperature, the velocity of sound in oxygen will be equal to its velocity in nitrogen at 14°C?

A. 45° C

B. 55° C

C. 20° C

D. 35° C

Answer: B

View Text Solution

8. An open pipe is in resonance in its 2nd harmonic with tuning fork of frequency f_1. Now it is closed at one end. If the frequency of the tuning fork is increased slowly from f_1 then again a resonance is obtained with a frequency f_2 . If in this case the pipe vibrates nth harmonics then

A. $n = 3, f_2 = \frac{3}{4} f_1$

B. $n = 3, f_2 = \frac{5}{4} f_1$

C. $n = 5, f_2 = \frac{5}{4} f_1$

D. $n = 5, f_2 = \frac{3}{4} f_1$

Answer: C

View Text Solution

9. A simple pendulum of length 1 m with a bob of mass m swings with an angular amplitude 30°. Then (g = 9.8 ms^{-2})

A. time period of pendulum is 2 s

B. tension in the string is greater than mgcos 15° at angular displacement 15°

C. rate of change of speed at angular displacement 15° is g sin 15°

D. tension in the string is $mg\cos 15^\circ$ at angulardisplacement 15°

Answer: B::C

View Text Solution

10. A particle of mass m is located in a one dimensional potential field where potential energy is given by V(x) = A(1 - cospx), where A and p are constants. The period of small oscillations of the particle is

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

B. $2\pi\sqrt{\frac{m}{Ap^2}}$

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

D. $\frac{1}{2\pi}\sqrt{\frac{Ap}{m}}$

Answer: B

View Text Solution

Wb Jee Previous Years Questions Category 1 Single Option Correct Type 1 Mark

1. A travelling acoustic wave of frequency 500 Hz is moving along the positive x-direction with a velocity of 300 ms^{-1}. The phase difference between two points x_1 and x_2 is 60°. Then the minimum separation between the two points is

A. 1 mm

B. 1 cm

C. 10 cm

D. 1 m

Answer: C

View Text Solution

2. The fundamental frequency of a closed pipe is equal to the frequency of the second

harmonic of an open pipe. The ratio of their lengths is

A. $1:2$

B. $1:4$

C. $1:8$

D. $1:16$

Answer: B

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3. A car moving at a velocity of 17 ms^{-1} towards an approaching bus that blows a horn at a frequency of 640 Hz on a straight track. The frequency of this horn appears to be 680 Hz to the car driver. If the velocity of sound in air is 340 ms^{-1} , then the velocity of the approaching bus is

A. $2ms^{-1}$

B. $4ms^{-1}$

C. $8ms^{-1}$

D. $10ms^{-1}$

Answer: B

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4. When a particle executing SHM oscillates with a frequency v, then the kinetic energy of the particle,

A. changes periodically with a frequency of u.

B. changes periodically with a frequency of 2u.

C. changes periodically with a frequency of v/2.

D. remains constant.

Answer: B

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5. The displacement of a particle in a periodic motion is given by $y = 4\cos^2\left(\frac{t}{2}\right)\sin(1000t)$. This displacement may be considered as the result of superposition of n independent harmonic oscillations. Here n is

A. 1

B. 2

C. 3

D. 4

Answer: C

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6. A whistle whose air column is open at both ends has a fundamental frequency of 5100 Hz. If the speed of sound in air is 340 ms^{-1}, the length of the whistle, in cm, is

A. $5/3$

B. $10/3$

C. 5

D. $20/3$

Answer: B

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7. A car is moving with a speed of 72 km hour^{-1} towards a roadside source that emits sound at a frequency of 850 Hz. The car driver listens to the sound while approaching the source and again while moving away from the source after crossing it. If the velocity of sound is 340 ms^{-1} the difference of the two frequencies, the driver hears is

A. 50 Hz

B. 85 Hz

C. 100 Hz

D. 150 Hz

Answer: C

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8. A simple pendulum of length L swings in a vertical plane. The tension of the string when it makes an angle θ with the vertical and the

bob of mass m moves with a speed v is (g is the gravitational acceleration)

A. mv^2 / L

B. $mg\cos\theta + mv^2 / L$

C. $mg\cos\theta - mv^2 / L$

D. $mg\cos\theta$

Answer: B

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9. The length of an open organ pipe is twice the length of another closed organ pipe. The fundamental frequency of the open pipe is 100 Hz. The frequency of the third harmonic of the closed pipe is

A. 100 Hz

B. 200 Hz

C. 300 Hz

D. 150 Hz

Answer: C

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10. A train is moving with a uniform speed of 33 m/s and an observer is approaching the train with the same speed. If the train blows a whistle of frequency 1000 Hz and the velocity of sound is 333 m/s, then the apparent frequency of the sound that the observer hears is

A. 1220 Hz

B. 1099 Hz

C. 1110 Hz

D. 1200 Hz

Answer: A

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11. A particle vibrating simple harmonically has an acceleration of 16 cms^{-2} when it is at a distance of 4 cm from the mean position. Its time period is

A. 1s

B. 2.571 s

C. 3.142 s

D. 6.028 s

Answer: C

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12. For air at room temperature the atmospheric pressure is $1.0 \times 10^5 Nm^{-2}$ and density of air is 1.2 kgm^{-3}. For a tube of

length 1.0 m closed at one end the lowest frequency generated is 84 Hz. The value of y (ratio of two specific heats) for air is

A. 2.1

B. 1.5

C. 1.8

D. 1.4

Answer: D

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13. The velocity of sound in air at 20 °C and 1 atm pressure is 344.2 m/s. At 40 °C and 2 atm pressure, the velocity of sound in air is approximately

A. 250 m/s

B. 356 m/s

C. 363 m/s

D. 370 m/s

Answer: B

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14. The velocity of a particle executing a simple harmonic motion is $13ms^{-1}$ when its distance from the equilibrium position (Q) is 3 m and its velocity is 12 ms^{-1} when it is 5 m away from Q. The frequency of the simple harmonic motion is

A. $\frac{5\pi}{8}$

B. $\frac{5}{8\pi}$

C. $\frac{8\pi}{5}$

D. $\frac{8}{5\pi}$

Answer: B

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15. A uniform string of length L and mass M is fixed at both ends while it is subject to a tension T. It can vibrate at frequencies (v) given by the formula where n= 1,2,3.....

A. $v = \frac{n}{2}\sqrt{\frac{T}{ML}}$

B. $v = \frac{n}{2L}\sqrt{\frac{T}{M}}$

C. $v = \frac{1}{2n}\sqrt{\frac{T}{ML}}$

D. $v = \frac{n}{2}\sqrt{\frac{TL}{M}}$

Answer: A

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16. In case of a simple harmonic motion, if the velocity is plotted along the X-axis and the displacement (from the equilibrium position) is plotted along the Y-axis, the resultant curve happens to be an ellipse with the ratio $= \frac{\text{major axis along X}}{\text{minor axis along Y}} = 20\pi$

What is the frequency of the simple harmonic motion?

A. 100 Hz

B. 20 Hz

C. 10 Hz

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

Answer: C

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Wb Jee Previous Years Questions Category 2 Single Option Correct Type 2 Marks

1. Two simple harmonic motions are given by $x_1 = a\sin\omega t + a\cos\omega t$ and $x_2 = a\sin\omega t + \frac{a}{\sqrt{3}}$ 01. The ratio of the amplitudes of first and second motion and the phase difference between them are respectively

A. $\sqrt{\frac{3}{2}}$ and $\frac{\pi}{12}$

B. $\frac{\sqrt{3}}{2}$ and $\frac{\pi}{12}$

C. $\frac{2}{\sqrt{3}}$ and $\frac{\pi}{12}$

D. $\sqrt{\frac{3}{2}}$ and $\frac{\pi}{6}$

Answer: A

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2. A small mass m attached to one end of a spring with a negligible mass and an unstretched length L, executes vertical oscillations with angular frequency ω_0 When the mass is rotated with an angular speed ω

by holding the other end of the spring at a fixed point, the mass moves uniformly in a circular path in a horizontal plane. Then the increase in length of the spring during this rotation is

A. $\frac{\omega^2 L}{\omega_0^2 - \omega^2}$

B. $\frac{\omega_0^2 L}{\omega^2 - \omega_0^2}$

C. $\frac{\omega^2 L}{\omega_0^2}$

D. $\frac{\omega_0^2 L}{\omega^2}$

Answer: A

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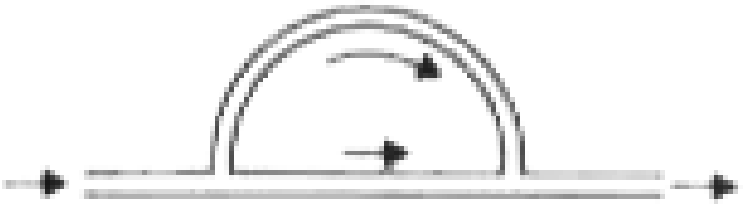
3. Sound waves are passing through two routes- one in straight path and the other along a semicircular path of radius r and are again combined into one pipe and superposed as shown in the figure. If the velocity of sound waves in the pipe is y, then frequencies of resultant waves of maximum amplitude will be integral multiples of



A. $\frac{v}{r(\pi-2)}$

B. $\frac{v}{r(\pi-1)}$

C. $\frac{2v}{r(\pi-1)}$

D. $\frac{v}{r(\pi+1)}$

Answer: A

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Wb Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type 2 Marks

1. If the pressure, temperature and density of an ideal gas are denoted by P, T and ρ, respectively, the velocity of sound in the gas is

A. proportional to $\sqrt{P}$, when T is constant

B. proportional to $\sqrt{T}$

C. proportional to $\sqrt{P}$, when ρ is constant

D. proportional to T.

Answer: B::C

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2. The intensity of a sound appears to an observer to be periodic. Which of the following can be the cause of it?

A. The intensity of the source is periodic

B. The source is moving towards the observer

C. The observer is moving away from the source

D. The source is producing a sound composed of two nearby frequencies.

Answer: A::D

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