PHYSICS

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OSCILLATIONS

Evaluation Textbook Questions And Answers Multiple Choice Questions

1. In a simple harmonic oscillation, the acceleration against displacement for one

complete oscillation will be.

A. an ellipse

B. a circle

C. a parabola

D. a straight line

Answer: D

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2. A particle executing SHM crossed points A and B with the same velocity. Having taken 3 s in passing from A to B, it returns to B after another 3s. The time period is :

A. 15 s

B. 6 s

C. 12 s

D. 9 s

Answer: C

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3. The length of a second's pendulum on the surface of the Earth is $0.9m$. The length of the same pendulum of surface of planet X such that the acceleration of planet X is n times greater than the Earth is :

A. $0.9n$

B. $\frac{0.9}{n}m$

C. $0.9n^2m$

D. $\frac{0.9}{n^2}$

Answer: A

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4. A simple pendulum is suspended from the roof of a school bus which movies in a horizontal direction with an acceleration a, then the time period is :

A. $T \propto \frac{1}{g^2 + a^2}$

B. $T \propto \frac{1}{\sqrt{g^2 + a^2}}$

C. $T \propto \sqrt{g^2 + a^2}$

D. $T \propto \left(g^2 + a^2\right)$

Answer: B

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5. Two bodies A and B whose masses are in the ratio $1:2$ are suspended from two separate massless springs of force constants k_A and k_B respectively. If the two bodies oscillate vertically such that their maximum

velocities are in the ratio $1:2$ the ratio of the amplitude A to that of B is :

A. $\sqrt{\frac{k_B}{2k_A}}$

B. $\sqrt{\frac{k_B}{8k_A}}$

C. $\sqrt{\frac{2k_B}{k_A}}$

D. $\sqrt{\frac{8k_B}{k_A}}$

Answer: B

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6. A spring is connected to a mass m suspended from it and its time period for vertical oscillation is T. spring is now cut into two equal halved and the same mass is suspended fron one of the havles. The period of vertical oscillation is :

A. $T' = \sqrt{2}T$

B. $T' = \frac{T}{\sqrt{2}}$

C. $T' = \sqrt{2T}$

D. $T' = \sqrt{\frac{T}{2}}$

Answer: B

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7. The time peirod for small vertical oscillations of block of mass m when the masses of the pulleys are negligible and spring constnat k_1 and k_2 is

A. $T = 4\pi\sqrt{m\left(\frac{1}{k_1} + \frac{1}{k_2}\right)}$

B. $T = 2\pi\sqrt{m\left(\frac{1}{k_1} + \frac{1}{k_2}\right)}$

C. $T = 4\pi\sqrt{m(k_1 + k_2)}$

D. $T = 2\pi\sqrt{m(k_1 + k_2)}$

Answer: A

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8. A simple pendulum has a time period T_1. When its point of suspension is moved vertically upwards according as $y = kt^2$, where y is vertical covered and $k = 1ms^{-2}$,

its time period becomes T_2 then $\frac{T_1^2}{T_2^2}$ is (g $= 10ms^{-2}$)

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

B. $\frac{11}{10}$

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

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

Answer: C

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9. An ideal spring of spring constant k, is suspended from the ceiling of a room and a blok of mass m is fastened to its lower end. If the block is released when the spring is un-stretched, then then maximum extension in the spring is :

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

B. $\frac{mg}{k}$

C. $2\frac{mg}{k}$

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10. A pendulum is hung in a very high building and is moving freely to and fro like a simple harmonic oscillator. If the acceleration of the bob is $16ms^{-1}$ at a distance of 4 m from the mean position, then the time period is

A. 2s

B. 1 s

C. $2\pi s$

D. πs

Answer: D

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11. A hollow sphere is filled with water . It is hung by a long thread . As the water flows out of a hole at the bottom , the period of oscillation will

A. first increases and then decrease

B. first decrease and then increase

C. increases continuously

D. decreases continuously

Answer: A

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12. The damping force on an oscillator is directly proportional to the velocity . The units of the constant of proportionality are

A. $kgms^{-1}$

B. $kgms^{-2}$

C. kgs^{-1}

D. kgs

Answer: C

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13. When a damped harmonic oscillator completes 100 oscillations, its amplitude is reduced to $\frac{1}{3}$ of its initial value. What will be

its amplitude when it completes 200 oscillations ?

A. $\frac{1}{5}$

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

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

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

Answer: B

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14. Which of the following different equations represents a damped harmonic oscillator ?

A. $\frac{d^2y}{dt^2} + y = 0$

B. $\frac{d^2y}{d^2} + \gamma\frac{dy}{dt} + y = 0$

C. $\frac{d^2y}{dt^2} + k^2y = 0$

D. $\frac{dy}{dt} + y = 0$

Answer: B

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15. If the inertial mass and gravitational mass of the simple pendulum of length l are not equal, then the time period of the simple pendulum is :

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

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

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

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

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

Answer: A

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Evaluation Textbook Questions And Answers Short Answers Questions

1. What is meant by periodic and non-periodic motion ? Give any two examples , for each motion ?

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2. What is meant by mean by force constant of a spring ?

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3. Define time period of simple harmonic motion.

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4. Define frequency of simple harmonic motion.

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5. what is an epoch ?

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6. Write short note on plasma.

Watch Video Solution

7. Write short note on plasma.

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8. Write down the time period of simple pendulum.

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9. State the laws of simple pendulum.

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10. Write down the equation of time period for linear harmonic oscillator ?

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11. What is meant by free oscillation ?

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12. Explain damped oscillation . Give an example.

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13. Define forced oscillation . Give an example.

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14. What is meant by maintained oscillation ? Given an example.

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15. Explain resonance. Give an example .

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20. what is an epoch ?

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21. Write short notes on two springs connected in series.

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22. Write short notes on two springs connected in parallel.

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23. Write down the time period of simple pendulum.

Watch Video Solution

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25. Write down the equation of time period for linear harmonic oscillator ?

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Given an example.

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Evaluation Textbook Questions And Answers Long Answwers Questions

1. What is meant by simple harmonic oscillation ? Give example

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2. Simple harmonic motion is the projection of uniform circular motion on

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3. What is meant by angular harmonic oscillation ? Compute the time period of

angular harmonic oscillation.

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4. Write down the difference between simple harmonic motion and angular simple harmonic motion.

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5. Discuss the simple pendulum in detail.

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6. Explain the horizontal oscillations of a spring.

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7. Explain the horizontal oscillations of a spring.

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8. Write shorts notes on the oscillations of liquid column in U-tube.

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9. Discuss in detail the energy in simple harmonic motion.

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10. Explain in detail the four different types of oscillations.

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Watch Video Solution

20. Explain in detail the four different types of oscillations.

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Evaluation Textbook Questions And Answers Numerical Problems

1. Consider the Earth as a homogenous sphere of radius R and a straight hole is bored in it through its centre. Show that a particle dropped into the hole will execute a simple

harmonic motion such that its time period is

$$T = 2\pi\sqrt{\frac{R}{g}}$$

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2. Calculate the time period of the oscillation of a particle of mass m moving in the potential defined as $U(x) = \begin{cases} \frac{1}{2}kx^2, & x < 0 \\ mgx, & g > 0 \end{cases}$

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3. Consider a simple pendulum of length l = 0.9 m which is properly placed on a trolley rolling down on a inclined plane which is at $0 = 45^{\circ}$ with the horizontal. Assuming that the inclined plane is frictionless. Assuming that the time period of oscillation of the simple pendulum is T. Find the value of T.

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4. A piece of wood of mass m is floating erect in a liquid whose density is ρ . If it is slightly pressed down and released, then executes simple harmonic motion. Show that its time period of oscillation is $T = 2\pi\sqrt{\frac{m}{A\rho g}}$

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5. A particle executing simple harmonic motion along - y - axis has its motion described by the equation $y = A\sin(\omega t) + B$

, the amplitude of the example harmonic motion is

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6. A particle is subjected to two simple harmonic motions along x and y directions according to $x = 3\sin 100\pi t, y = 4\sin 100\pi t.$

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7. A particle is subjected to two mutually perpendicular simple harmonic motions such that its X and y coordinates are given by $X = 2\sin\omega t$, $y = 2\sin\left(\omega + \frac{\pi}{4}\right)$

The path of the particle will be:

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8. A particle is subjected to two simple harmonic motions along x and y directions according to $x = 3\sin 100\pi t, y = 4\sin 100\pi t.$

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9. A particle executing simple harmonic motion along y -axis has its motion described by the equation $y = A\sin(\omega t) + B$. The amplitude of the simple harmonic motion is

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10. Show that for a particle executing simple harmonic motion the average value of kinetic

energy is equal to the average value of potential energy.

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12. Computer the time period for the following system if the block of mass m is slightly displaced vertically down from its equilibrium position and then released. Assume that the pulley is light and smooth, string and spring are light.

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17. Consider two simple harmonic motion along x and y- axis having same frequencies

but different amplitudes as $x = A\sin(\omega t + \varphi)$ (along x axis) and $y = B\sin\omega t$(along y axis).

then show that $\frac{x^2}{A^2} + \frac{y^2}{B^2} - \frac{2xy}{AB}\cos\varphi = \sin^2\varphi$ and also discuss the special cases when

$\varphi = 0$

Note : when a particle is subjected to two simple harmonic motion at right angle to each other the particle may move along different paths.

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18. Consider two simple harmonic motion along x and y- axis having same frequencies but different amplitudes as $x = A\sin(\omega t + \varphi$) (along x axis) and $y = B\sin\omega t$(along y axis). then show that $\frac{x^2}{A^2} + \frac{y^2}{B^2} - \frac{2xy}{AB}\cos\varphi = \sin^2\varphi$ and also discuss the special cases when

$\varphi = \pi$

Note : when a particle is subjected to two simple harmonic motion at right angle to each other the particle may move along different paths.

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Note : when a particle is subjected to two simple harmonic motion at right angle to each other the particle may move along different paths.

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22. Show that for a particle executing simple harmonic motion average value of kinetic energy is equal to the average value of potential energy.

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23. Show that for a particle executing simple harmonic motion the average value of kinetic energy is equal to the average value of potential energy.

Watch Video Solution

24. Computer the time period for the following system if the block of mass m is slightly displaced vertically down from its equilibrium position and then released. Assume that the pulley is light and smooth, string and spring are light.

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Other Important Questions Answers Multiple Choice Questions

1. Assertion : In simple harmonic motion the velocity is maximum when the acceleration is minimum.

Reason : In simple harmonic motion the phase difference between velocity and acceleration is $\frac{\pi}{2}$

Select the correct option form the following.

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

assertion

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

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: A

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2. The compostion of two simple harmonic motions of equal periods at right angle to each other and with a phase difference of π results in the displacement of the particle along :

A. a circle

B. an ellipse

C. the figure of eighta

D. a striaght line

Answer: D

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3. Two simple harmonic motions with the same frequency act on a particle at right angles i.e, along x and y axis. If the two amplitudes are equal and the phase difference is $\frac{\pi}{2}$ the resultant motion will be :

A. a circle

B. an ellipse with the major axis along y-axis

C. an ellipse with the major axis along y-axis

D. an straight line inclined at 45° to the x-axis

Answer: A

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4. Choose the odd man out from the following :

A. Oscillation of a simple pendululm

B. Oscillation of a liquid pendululm

C. Oscillation of a spring

D. Uniform motion of a car

Answer: D

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5. The displacement eqution of a particle is $x = 3\sin 2t + 4\cos 2t$. The amplitude and maximum velocity will be respetively

A. 5,10

B. 3,2

C. 4,2

D. 3,4

Answer: A

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

A. $a = -200x^2$

B. $a = -10x$

C. $a = 100x^3$

D. $a = 0.7x$

Answer: B

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7. Assertion : In simple harmonic motion, the motion is to and fro and periodic.

Reason : Velocity of particle in SHM is

$v = \omega\sqrt{a^2 - x^2}$

Select the correct statement from the following.

A. **Both assertion and reason are true and reason is the correct explanation of assertion**

B. **Both assertion and reason are true and reason is not the correct explanation of assertion**

C. **Both assertion and reason are false**

D. Assertion is true and reason is false

Answer: B

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8. The motion which is not simple harmonic is :

A. oscillation of a liquid column is a U-tube

B. motion of a planet around the Sun

C. motion of simple pendulum

D. vertical oscillations of a spring

Answer: B

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9. For a particle executing simple harmonic motion select correct relation for the acceleration of the particle.

Where ω is the angular frequency of the particle.

A. Acceleration $= -\omega \times$ displacement

B. Acceleration $= -\omega^2 \times$ displacement

C. Acceleration $= -\omega^2 \times$ velocity

D. Acceleration $= \omega \times$ velocity

Answer: B

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10. 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

ω = frequency of oscillation.

Which one of the following graph shows correctly the variation a with ?

A. 

B. 

C. 

D. 

Answer: D

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11. In case of a forced vibration, the resonance wave becomes very sharp when the :

A. applied periodic force is small quality factor is small

B. quality factor is small

C. damping force is small

D. restoring force is small

Answer: C

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12. Match the type of motion given in column I with the function given in column II.

A. $1-(ii), 2-(iii), 3-(vi), 4-(i)$

B. $1-(iv), 2-(vi), -(i), 4-(ii)$

C. $1-(vi), 2-(v), 3-(i), 4-(iv)$

D. $1-(i), (2)-(iv), 3-(v), 4-(vi)$

Answer: B

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13. The physical quantity which remains constant in simple harmonic motion is :

A. potetntial energy

B. kinetic energy

C. displacemnt

D. frequency

Answer: D

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

A. linear oscillator`

B. damped oscillator

C. forced oscillator

D. simple harmonic oscillator

Answer: B

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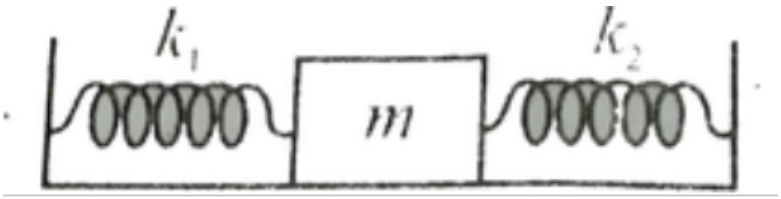
15. If both spring constant k_1 and k_2 are increased to $4k_1$ and $4k_2$ respectively, then new frequency in terms of original frequency f is :



A. 2f

B. f

C. 4f

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

Answer: A

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16. Which one of the following graphs indicates the variations of time period (T) of a simple pendulum to with the its length (l) is :

A. 

B. 

C. 

D. 

Answer: B

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17. If a spring constant k is divided into n equal parts, then the spring constant of each parth is :

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

B. nk

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

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

Answer: B

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18. What is the length of a simple pendulum, which ticks seconds ?

A. 2m

B. 1 m

C. 4 m

D. 3 m

Answer: B

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19. The length of second pendulums is 1 m on earth . If mass and diameter of the planet is doubled than that or earth length becomes :

A. 2 m

B. $0.5m$

C. 4 m

D. 1 m

Answer: B

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20. The mass and diameter of a planet are twice those of the earth. What will be the time period of that pendulum on this planet which is a seconds pendulum on the earth.

A. $2\sqrt{2}s$

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

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

D. 2 s

Answer: A

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21. The displacement (x) of a particle is given by $x = a\sin(bt + c)$ where a, b and c are constants of motion.

Select the incorrect statement from the following .

A. The energy of the partical in simple harmonic motion remains constant

B. The velocity of the particle is zero at $x = \pm a$.

C. The acceleration of the particle is zero at $x = \pm a$.

D. The motion represented by the given equation rpeats itself a time internal $\frac{2\pi}{b}$

Answer: C

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22. Starting from the origin a body executes simple harmonic oscillation with the period 2s. The time after which its potential energy will be $25\ \%$ of the total energy is :

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

B. $\frac{\pi}{6\omega}$

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

D. $\frac{\pi}{9\omega}$

Answer: B

Watch Video Solution

23. In SHM, amplitude of kintetic energy is $\left(\frac{l}{4}\right)^{th}$ of the total energy at a displacement equal to:

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

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

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

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

Answer: B

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24. Select the correct statement for a body in simple harmonic motion, loss of kinetic energy is proportional to :

A. x^3

B. x^2

C. $\log x$

D. e^x

Answer: B

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25. Which one of the following graphs represent the variation of kinetic energy (k) with time ?

A. 

B. 

C. 

D. 

Answer: B

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26. Select the correct pair from the following given pair.

A. Oscillations of a simple pendulum and electromagnetic oscillations in tank circuit.

B. Oscillation of a simple pendulum and vibrations of a tuning fork.

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27. A particle is executing SHM at mid point of mean position & extremity . What is the potential energy in terms of total energy (E)

A. $0 \text{ and } 2k_0$

B. $\frac{k_0}{2} \text{ and } k_0$

C. k_0 and $2k_0$

D. k_0 and k_0

Answer: D

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28. A bottel weighing 220 g and of area of cross-section $50cm^2$, and height 4 cm oscillats on the surface of water in vertical position. Its frequency of oscillation is :

A. $2.5Hz$

B. $4.5Hz$

C. $3.5Hz$

D. $1.5Hz$

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For a particle executing SHM

A. Time period $T = \frac{2\pi}{\omega}$, acceleration $a = -\omega^2 x$

B. Time period $T = \frac{2\pi}{\omega}$, acceleration $a = \omega^2 x$

C. Velocity $v = a\omega$ displacement $x = a\sin\omega t$

D. Velocity $v = a\omega$ acceleration $a = -\omega^2 x$

Answer: B

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

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

C. $A\sqrt{2}$

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

Answer: A

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31. Resonance is an example of :

A. tuning of

B. damped variation

C. forced vibration

D. free vibration

Answer: C

Watch Video Solution

32. In a simple harmonic motion, when the displacement it one- half of the amplitude, what fraction of the total energy (E) is kinetic ?

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

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

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

D. 2E

Answer: C

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33. Assertion : In simple harmonic motion the velocity is maximum when the acceleration is minimum.

Reason : In simple harmonic motion the phase difference between velocity and acceleration is $\frac{\pi}{2}$

Select the correct option form the following.

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

assertion

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

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: A

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34. The compostion of two simple harmonic motions of equal periods at right angle to each other and with a phase difference of π results in the displacement of the particle along :

A. a circle

B. an ellipse

C. the figure of eighta

D. a striaght line

Answer: D

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35. Two simple harmonic motions with the same frequency act on a particle at right angles i.e, along x and y axis. If the two amplitudes are equal and the phase difference is $\frac{\pi}{2}$ the resultant motion will be :

A. a circle

B. an ellipse with the major axis along y-axis

C. an ellipse with the major axis along y-axis

D. an straight line inclined at 45° to the x-axis

Answer: A

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36. Choose the odd man out from the following :

A. Oscillation of a simple pendululm

B. Oscillation of a liquid pendululm

C. Oscillation of a spring

D. Uniform motion of a car

Answer: D

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37. The displacement eqution of a particle is $x = 3\sin 2t + 4\cos 2t$. The amplitude and maximum velocity will be respetively

A. 5,10

B. 3,2

C. 4,2

D. 3,4

Answer: A

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38. Which of the following relationship between the acceleration a and the

displacement x of a particle involve simple harmonic motion ?

A. $a = -200x^2$

B. $a = -10x$

C. $a = 100x^3$

D. $a = 0.7x$

Answer: B

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39. Assertion : In simple harmonic motion, the motion is to and fro and periodic.

Reason : Velocity of particle in SHM is $v = \omega\sqrt{a^2 - x^2}$

Select the correct statement from the following.

A. **Both assertion and reason are true and reason is the correct explanation of assertion**

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

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: B

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40. The motion which is not simple harmonic is :

A. oscillation of a liquid column is a U-tube

B. motion of a planet around the Sun

C. motion of simple pendulum

D. vertical oscillations of a spring

Answer: B

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41. For a particle executing simple harmonic motion select correct relation for the acceleration of the particle.

Where ω is the angular frequency of the particle.

A. Acceleration $= -\omega \times$ displacement

B. Acceleration $= -\omega^2 \times$ displacement

C. Acceleration $= -\omega^2 \times$ velocity

D. Acceleration $= \omega \times$ velocity

Answer: B

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42. 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

ω = frequency of oscillation.

Which one of the following graph shows correctly the variation a with ?

A. 

B. 

C. 

D. 

Answer: D

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43. In case of a forced vibration, the resonance wave becomes very sharp when the :

A. applied periodic force is small quality factor is small

B. quality factor is small

C. damping force is small

D. restoring force is small

Answer: C

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44. Match the parameters given in column I with the expressions given in column II.

Column I	Column II
1. Elastic potential energy	*(i)* mgh
2. Kinetic energy	*(ii)* F.s
3. Potential energy	*(iii)* $F.s\cos\theta$
4. Work done by a constant force	*(iv)* $\frac{1}{2}mv^2$
	(v) $\frac{1}{2}kx^2$
	(vi) $F\cos\theta(r_1 - r_2)$

A. $1-(ii), 2-(iii), 3-(vi), 4-(i)$

B. $1-(iv), 2-(vi), -(i), 4-(ii)$

C. $1-(vi), 2-(v), 3-(i), 4-(iv)$

D. $1-(i),(2)-(iv),3-(v),4-(vi)$

Answer: B

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45. The physical quantity which remains constant in simple harmonic motion is :

A. potetntial energy

B. kinetic energy

C. displacement

D. frequency

Answer: D

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

A. linear oscillator`

B. damped oscillator

C. forced oscillator

D. simple harmonic oscillator

Answer: B

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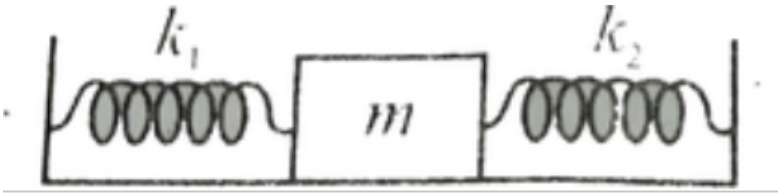
47. If both spring constant k_1 and k_2 are increased to $4k_1$ and $4k_2$ respectively, then new frequency in terms of original frequency f

is :



A. 2f

B. f

C. 4f

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

Answer: A

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48. The graph between the time period and the length of a simple pendulum is a:

A. Straight line

B. Curve

C. Ellipse

D. Parabola

Answer: D

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49. If a spring constant k is divided into n equal parts, then the spring constant of each parth is :

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

B. nk

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

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

Answer: B

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50. What is the length of a simple pendulum, which ticks seconds ?

A. 2m

B. 1 m

C. 4 m

D. 3 m

Answer: B

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51. The length of second pendulums is 1 m on earth . If mass and diameter of the planet is doubled than that or earth length becomes :

A. 2 m

B. $0.5m$

C. 4 m

D. 1 m

Answer: B

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52. The mass and the radius of a planet are twice that of earth. Then period of oscillation of a second pendulum on that planet will be :

A. $2\sqrt{2}s$

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

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

D. 2 s

Answer: A

Watch Video Solution

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Select the incorrect statement from the following .

A. The energy of the particle in simple harmonic motion remains constant

B. The velocity of the particle is zero at $x = \pm a$.

C. The acceleration of the particle is zero at

$$x = \pm a.$$

D. The motion represented by the given equation repeats itself a time interval

$$\frac{2\pi}{b}$$

Answer: C

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54. Starting from the origin a body executes simple harmonic oscillation with the period 2s. The time after which its potential energy will be $25\ \%$ of the total energy is :

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

B. $\frac{\pi}{6\omega}$

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Answer: B

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Watch Video Solution

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

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Answer: B

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56. Select the correct statement for a body in simple harmonic motion, loss of kinetic energy is proportional to :

A. x^3

B. x^2

C. $\log x$

D. e^x

Answer: B

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57. Which one of the following graphs represent the variation of kinetic energy (k) with time ?

A. 

B. 

C. 

D. 

Answer: B

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D. Vibrations in a stretched string and oscillations of the point in dead beat in a galvanometer.

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A. 0 and $2k_0$

B. $\frac{k_0}{2}$ and k_0

C. k_0 and $2k_0$

D. k_0 and k_0

Answer: D

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60. A bottel weighing 220 g and of area of cross-section $50cm^2$, and height 4 cm oscillats on the surface of water in vertical position. Its frequency of oscillation is :

A. $2.5Hz$

B. $4.5Hz$

C. $3.5Hz$

D. $1.5Hz$

Answer: A

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61. Select the incorrect pair from the following given pairs :

For a particle executing SHM

A. Time period $T = \frac{2\pi}{\omega}$, acceleration $a = -\omega^2 x$

B. Time period $T = \frac{2\pi}{\omega}$, acceleration $a = \omega^2 x$

C. Velocity $v = a\omega$ displacement $x = a\sin\omega t$

D. Velocity $v = a\omega$ acceleration

$$a = -\omega^2 x$$

Answer: B

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

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

C. $A\sqrt{2}$

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

Answer: A

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63. Resonance is an example of :

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D. free vibration

Answer: C

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64. In a simple harmonic motion, when the displacement it one- half of the amplitude, what fraction of the total energy (E) is kinetic ?

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

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

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

D. 2

Answer: C

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Other Important Questions Answers Very Short Answer Questions

1. State the values of amplitude and frequency of a particle having the equation of simple harmonic motion as.

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2. What is phase difference between the displacement and acceleration of a particle executing S.H.M ?

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3. Which physical quantity is conserved during the oscillation of a simple pendulum ?

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4. Wrtie the displacement equation representing the following obtained in a SHM: Amplitude $= 0.02m$, frequency $= 500Hz$ initial phase $= \frac{\pi}{3}$

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5. What are the maximum values of potential energy and kinetic energy of a harmonic oscillator ?

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6. A simple hormonic motion of acceleration a and displacement x is represented by $a + 4\pi^2 x = 0$. What is the time period of S.H.M ?

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9. State two basic characterstic of an oscillating system

Watch Video Solution

10. Can we use pendulum clock inside an artifical statellite ?

Watch Video Solution

11. Is spring constant a dimensional constant ?

If yes then write its dimension.

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12. At what points is the energy entirely kinetic

Watch Video Solution

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Other Important Questions Answers Short Answer Questions

1. The amplitude of a SHM is halved. How does this affect Maximum velocity?

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2. The amplitude of a SHM is halved. How does this affect Maximum acceleration.

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3. What is the difference between forced oscillation and resonance ?

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4. State the expression for net compliance of a system containing n springs connected in Series and

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5. State the expression for net compliance of a system containing n springs connected in parallel.

View Text Solution

6. When an object is said to be in oscillation ? State examples.

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7. What will be the change in time period of a loaded spring . When to moon ?

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8. Why does a swinging simple pendulum eventually stop ?

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9. A pendulum is suspended in a stationary lift and its time period is T. what will be its time period when the lift goes up with uniform velocity ?

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10. Two unequal springs have same material are loaded with same load. Which one will have a larger value of time period ?

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11. What is meant by phase of a particle executing SHM ?

Watch Video Solution

12. How can the phase difference of two particles executing simple harmonic motions ?

Watch Video Solution

13. A nurse measured the average heart beats of a patient and reported to the doctor in terms of time period as $0.8s$. Express the heart beat of the patient in terms of number of beats measured per minute.

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14. A passing aeroplane sometimes caused the ratting of the windows of house. Given reason.

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15. Pendulums of two different length are suspended from an elastic chord. If one is set in oscillation will there be any resonance ? Why ?

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16. How is the force acting on a simple pendulum resolved ?

Watch Video Solution

17. State examples for linear simple harmonic oscillator.

Watch Video Solution

18. Give two examples for angular harmonic oscillator.

Watch Video Solution

19. What is torque constant ? State its unit.

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20. State examples for free oscillations.

Watch Video Solution

21. Mention few illustration for damped oscillations.

Watch Video Solution

22. Distinguish free vibrations from forced vibrations.

Watch Video Solution

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Other Important Questions Answers Long Answer Questions

1. Derive expressions for displacement, velocity and acceleration of a particle executing simple harmonic motion.

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2. Derive the expressions for displacement velocity and acceleration of a particle executes S.H.M.

Watch Video Solution

3. Explain the relation in phase between displacement, velocity an acceleration in SHM, graphically as well as theortically.

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4. Explain damped oscillation . Give an example.

Watch Video Solution

5. What is meant by resonance ? State an example.

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6. Show that for a simple harmonic motion, the phase difference between.

(a) displacement and velocity is $\frac{\pi}{2}$ radian or

(b) velocity and acceleration is $\frac{\pi}{2}$ radian or 90°.

(c) displacement and acceleration is π radian or 180°

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Watch Video Solution

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Other Important Questions Answers Numerical Problems

1. Which of the following functions represent SHM :

$\sin^2 \omega t$

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2. Which of the following functions represent SHM :

$\sin 2\omega t$

Watch Video Solution

3. Which of the following functions represent SHM :

$\sin \omega t + 2 \cos \omega t$

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4. Which of the following functions represent SHM :

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5. The time -period of a simple pendulum is 2s and its can go to and fro from equilibrium position at a maximum distance of 5 cm. if at the start of the motion the pendulum is the position of maximum displacements towars the right of the equilibrium position, then write the displacement equation of the pendulum.

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6. For particle in SHM, the displacement x of the particle as a function o time t is given as $x = A\sin(2\pi t)$. Here x is in cm and t is in second. Let the time taken by the particle to travel from x=0 to $x = \frac{A}{2}$ be t_1 and the time taken to travel from $x = \frac{A}{2}$ to x=A be t_2 find $\frac{t_1}{t_2}$

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7. A particle executing linear SHM has a maximum velocity of $40cms^{-1}$ and a maximum acceleration of $50cms^{-2}$. Find is amplitude and the period of oscillaton. Maximum velocity,

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8. A block of mass on kg is fastened to a spring with a apring constant $50Nm^{-1}$. The block is pulleed to a distance x=10 cm from its

equilibrium position at x=0 on a frictionless surface from rest at t=0. Write the expression fr its x (t) and v(t).

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9. A simple pendulum has time period T_1. The point of suspension is now moved upward according to the relation $y = kt^2 \left(k = 1ms^{-2}\right)$ where y is the vertical diplacement. The time period now becomes T_2. What is the ration $\frac{T_1^2}{T_2^2}$? Given $g = 10ms^{-2}$

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10. If the acceleration due to gravity on the moon is one-sixth of that on the earth. What will be the change in length of a second pendulum there so that it may beat a second there ? Take acceleration due to gravity on earth surface $= 9.8ms^{-2}$.

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11. A test tube weighing 10 g and external diameter 2 cm is floated vertically in water by placing 10 g of mercury at its bottom. The tube is depressed in water a little and then released. Find the time of oscillation. Take $g = 10ms^{-1}$

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12. A block is on horizontal slab which is moving horizontally. If block is not separated

from slab then determine angular frequency of oscillation.

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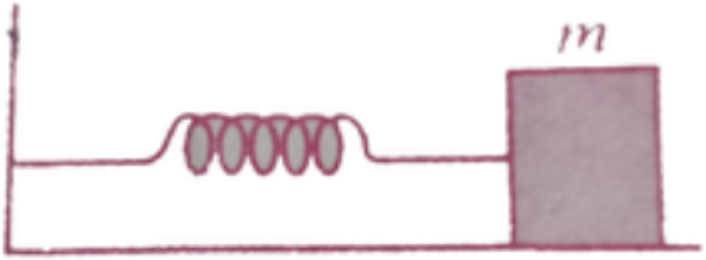
13. An impulsive force gives an intial velocity of $1.0ms^{-1}$ to the mass m in the unstretched spring position. What is the amplitude of motion ? Given that x is a function of time to for the oscillating mass. Give

$m = 3kg$ and $k = 1200Nm^{-1}$.



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14. Two indentical springs each of force constant k are connected in series and support mass m. Calculate time period of the system

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15. Two indentical springs each of force constant k are connected in paralle and they support a mass m. Calculate the time period of the system

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16. The identical spring of spring constant k are attached to a block of mass m and to fixed suppoorts as shown below.

Show that when the mass is displaced from its equilibrium position on either side, it executes a simple hoarmonic motion. Find the period of oscillations.

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17. Two identical springs each of force constant k are connected in series Calculate the frequency of the system

Watch Video Solution

18. Two identical springs each of force constant k are connected in parallel and they support a mass μ. Calculate the ratio of the frequency of oscillation of the mass in two systems.

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19. Three springs are connected to a mass as shown in figure (a). When mass oscillates, what is the effective spring constant and time period of vibration ? Given

$k = 2Nm^{-1}$ and $m = 80gm$.

View Text Solution

20. The frequency of oscillations of a mass m suspended by spring is v_1. If the length of the spring is cut to one- third, the same mass oscillates with frequency v_2. Determine the value of $\frac{v_2}{v_1}$.

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SHM :

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Watch Video Solution

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28. A block of mass on kg is fastened to a spring with a apring constant $50Nm^{-1}$. The block is pulleed to a distance x=10 cm from its

equilibrium position at x=0 on a frictionless surface from rest at t=0. Write the expression fr its x (t) and v(t).

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29. A simple pendulum has time period T_1. The point of suspension is now moved upward according to the relation $y = kt^2 \left(k = 1ms^{-2}\right)$ where y is the vertical diplacement. The time period now becomes T_2. What is the ration $\frac{T_1^2}{T_2^2}$? Given $g = 10ms^{-2}$

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30. If the acceleration due to gravity on the moon is one-sixth of that on the earth. What will be the change in length of a second pendulum there so that it may beat a second there ? Take acceleration due to gravity on earth surface $= 9.8ms^{-2}$.

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31. A test tube weighing 10 g and external diameter 2 cm is floated vertically in water by placing 10 g of mercury at its bottom. The tube is depressed in water a little and then released. Find the time of oscillation. Take $g = 10ms^{-1}$

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32. A block is on horizontal slab which is moving horizontally. If block is not separated

from slab then determine angular frequency of oscillation.

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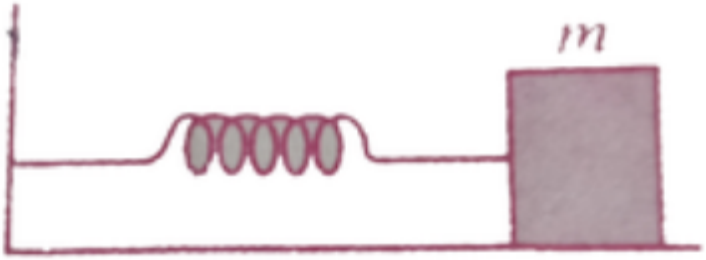
33. An impulsive force gives an intial velocity of $1.0ms^{-1}$ to the mass m in the unstretched spring position. What is the amplitude of motion ? Given that x is a function of time to for the oscillating mass. Give

$m = 3kg$ and $k = 1200Nm^{-1}$.



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34. Two indentical springs each of force constant k are connected in series and support mass m. Calculate time period of the system

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35. Two indentical springs each of force constant k are connected in paralle and they support a mass m. Calculate the time period of the system

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36. The identical spring of spring constant k are attached to a block of mass m and to fixed suppoorts as shown below.

Show that when the mass is displaced from its equilibrium position on either side, it executes a simple hoarmonic motion. Find the period of oscillations.

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37. Two identical springs each of force constant k are connected in series Calculate the frequency of the system

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38. Two identical springs each of force constant k are connected in parallel and they support a mass μ. Calculate the ratio of the frequency of oscillation of the mass in two systems.

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39. Three springs are connected to a mass as shown in figure (a). When mass oscillates, what is the effective spring constant and time period of vibration ? Given

$k = 2Nm^{-1}$ and $m = 80gm$.

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40. The frequency of oscillations of a mass m suspended by spring is v_1. If the length of the spring is cut to one- third, the same mass oscillates with frequency v_2. Determine the value of $\frac{v_2}{v_1}$.

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Other Important Questions Answers Conceptual Questions

1. Can a motion be periodic and not oscillatory ?

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2. What provides the restoring force for simple harmonic oscillations in the following cases : Spring

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4. What provides the restoring force for simple harmonic oscillations in the following cases? (i)simple pendulum (ii) spring (iii) column of mercury in U tube.

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5. Can we use pendulum clock inside an artifical statellite ?

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6. What determine the natural frequency of body ?

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7. Sometimes a wire glass is broken by the powerful voice of a celebrated singer why?

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8. During the oscillations of the bob of a simple pendulum. What is the quantity that remains constant ?

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9. A man with a writs on his hands fall from te top of a tower. Does the watch give correct time ?

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10. When is the tension maximum in the spring of a simple pendulum ?

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11. What is the frequency of variation of kinetic energy of SHM. When the frequency f ?

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12. What is the ratio of maximum acceleration to the maximum velocity of a simple harmonic oscillator ?

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13. Can a motion be periodic and not oscillatory ?

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14. What provides the restoring force of simple harmonic oscillations in the following cases :

Simple pendulum

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15. What provides the restoring force for simple harmonic oscillations in the following cases :

Spring

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Column of Hg in U-tube

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