PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

OSCILLATIONS

Physics

1. The time period of a second's pendulum is 2 sec. The spherical bob which is empty from inside has a mass of 50 gm. This is now replaced by another solid bob of same radius but having different mass of 100 gm. The new time period will be

A. 4sec

B. 1sec

C. 2sec

D. 8sec

Answer:

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2. The length of a simple pendulum is increased by 1%. Its time period will

A. Inrease by 1%

B. Increase by 0.5 %

C. Decrease by 0.5 %

D. Increase by 2%

Answer:

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3. The bob of a pendulum of length l is pulled aside from its equilibrium position through an angle θ and then released. The bob will then pass through its equilibrium position with a speed v, where v equals

A. $\sqrt{2gl(1+\sin\theta)}$

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

C. $\sqrt{2gl(1-\cos\theta)}$

D. $\sqrt{2gl(1+\sin\theta)}$

Answer:

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4. A simple pendulum is executing simple harmonic motion with a time period T. If the length of the pendulum is increased by 21%, the percentage increase in the time period of the pendulum of is

A. 0.1

B. 0.21

C. 0.3

D. 0.5

Answer:

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5. A chimpanzee swinging on a swing in a sitting position, stands up suddenly, the time period will

A. Become infinite

B. Remain same

C. Increase

D. Decrease

Answer:

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6. A simple pendulum consisting of a ball of mass m tied to a thread of length l is made to swing on a circular arc of angle q in a vertical plane. At the end of this arc, another ball of mass m is placed at rest. The momentum transferred to this ball at rest by the swinging ball is

A. Zero

B. $m\theta\sqrt{\frac{g}{l}}$

C. $\frac{m\theta}{l}\sqrt{\frac{l}{g}}$

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

Answer:

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7. The time period of a simple pendulum of length L as measured in an elevator descending with acceleration g / 3 is

A. $2\pi\sqrt{\frac{3L}{g}}$

B. $\pi\sqrt{\left(\frac{3L}{g}\right)}$

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

D. $2\pi\sqrt{\left(\frac{3L}{3g}\right)}$

Answer:

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8. A mass m is suspended from the two coupled springs connected in series. The force constant for springs are $k_1 \text{and} k_2$. The time period of the suspended mass will be

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

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

C. `T=2pisqrt((((m)(k_(1)+k_(2)))/(k_(1)k_(2))))

D. `T=2pisqrt(((mk_(1)k_(2))/(k_(1)+k_(2))))

Answer:

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9. A spring having a spring constant k is loaded with a mass m. The spring is cut into two equal parts and one of these is loaded again with the same mass. The new spring constant i

A. K/2

B. K

C. 2K

D. K^2

Answer:

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10. A mass m = 100 gm is attached at the end of a light spring which oscillates on a frictionless horizontal table with an amplitude equal to 0.16 metre and time period equal to 2 sec. Initially the mass is released from rest at t = 0 and displacement x = –0.16 metre. The expression for the displacement of mass at any time t is

A. $x = 0.16\cos(\pi t)$

B. $x = -0.16\cos(\pi t)$

C. $x = 0.16\sin(\pi t + \pi)$

D. $x = -00.16\sin(\pi t + \pi)$

Answer:

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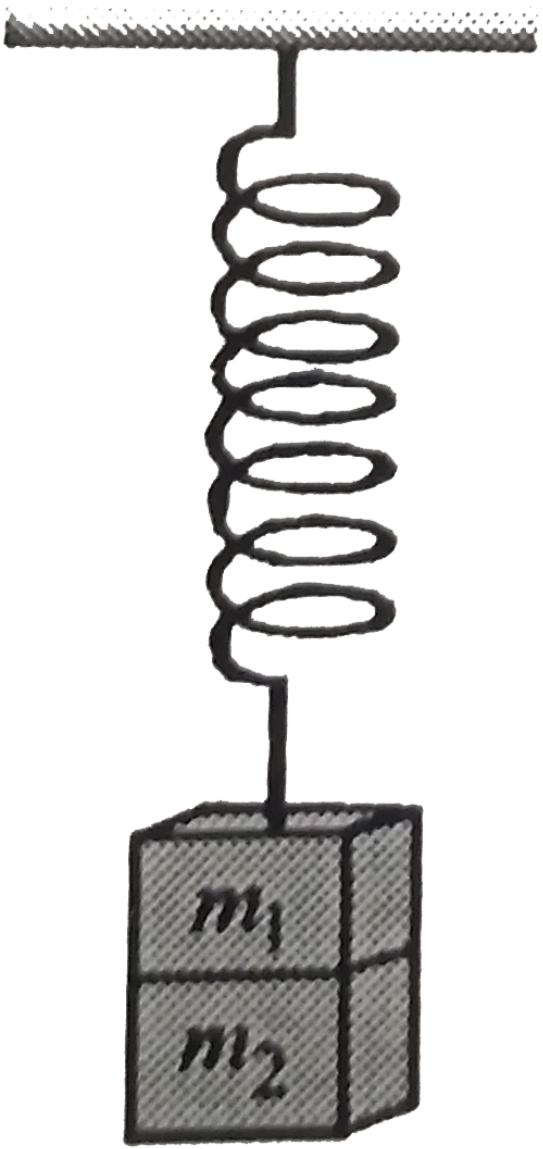
11. Two masses m1 and m2 are suspended together by a massless spring of constant k. When the masses are in equilibrium, m1 is removed without

disturbing the system. The amplitude of oscillations is



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

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

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

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

Answer:

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12. The composition of two simple harmonic motions of equal periods at right angle to each other and with a phase difference of p results in the displacement of the particle along

A. Straight line

B. Circle

C. Ellipse

D. Figire of 8

Answer:

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13. 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. $\omega_1 = \omega_0 \quad \text{and} \quad \omega_2 \not= \omega_0$

B. $\omega_1 = \omega_0 \quad \text{and} \quad \omega_2 = \omega_0$

C. `omega_(1)" "cancel(=)" " omega_(0)" " "and"" " omega_(2)" " =" " omega_(0)

D. `omega_(1)" "cancel(=)" " omega_(0)" " "and"" " omega_(2)" " cancel=" " omega_(0)

Answer:

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14. Amplitude of a wave is represented by $A\frac{c}{a+b+c}$ Then resonance will occur when

A. b=c/2

B. b = 0-c/2

C. b = 0 & a = c

D. b = 0- a/2

Answer:

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15. Two blocks A and B each of mass m are connected by a massless spring of natural length L and spring constant k. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length. A third identical block C also of mass m moves on the floor with a speed v along the line joining A and B and collides with A. Then

The kinetic energy of the A-B system at maximum compression of the spring is $mv^2/4$

The maximum compression of the spring $v\sqrt{m/3kThek} \in etice \neq rgyoftheA - Bsystemat \max i\mu mcompressio$r vsqrt(m//k)

A. 1.2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correct

Answer:

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16. A simple pendulum of length L and mass (bob) M is oscillating in a plane about a vertical line between angular limits $-\phi$ and $+\phi$ For an angular displacement $\theta(|\theta| < \phi)$. the tension in the string and the velocity of the bob are T and v respectively. The following relations hold

good under the above conditions

$$T - Mg\cos\theta = \frac{Mv^2}{L}$$

$$T\cos\theta = Mg$$

The magnitude of the tangential acceleration of the bob $|a_T| = g\sin\theta$

$$T = Mg\cos\theta$$

A. 1.2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correc

Answer:

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17. Identify wrong statements among the following

The greater the mass of a pendulum bob, the shorter is its frequency of oscillation

A simple pendulum with a bob of mass M swings with an angular

amplitude of 40°. When its angular amplitude is20°, the tension in the string is less than Mgcos20°. (3) The fractional change in the time period of a pendulum on changing the temperature is independent of the length of the pendulum.

As the length of a simple pendulum is increased, the maximum velocity of its bob during its oscillation will also decreases.

A. 1.2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correc

Answer:

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18. A particle performs linear SHM such that it is placed on plat- form & platform along with particles oscillate vertically up and down with amplitude A = 1cm. If the particle does not loose contact with platform

anywhere and mass of particle is 1 kg, find :

The minimum, possible time period $\left(\text{take} \quad \pi = \sqrt{g}\right)$

A. 0.1sec

B. 0.2sec

C. 0.3sec

D. 0.4sec

Answer:

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19. A particle performs linear SHM such that it is placed on plat- form & platform along with particles oscillate vertically up and down with amplitude A = 1cm. If the particle does not loose contact with platform anywhere and mass of particle is 1 kg, find :

For minimum time period condition average potential energy between t = 0 to t = 0.05 sec`("Take" " "g=10m//s^(2))

A. 0.025joule

B. 0.1 joule

C. 0.8 joule

D. 0.06 joule

Answer:

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20. Statement-1 : The periodic time of a hard spring is less as compared to that of a soft spring. Statement-2 : The periodic time depends upon the spring constant, and spring constant is large for hard spring

A. Statement -1 is True, Statement -2 is true., Satement -2 is a correct explanation for Statement -1

B. Statement-1 is True, Statement -2 is True , Statement -2 NOT a correct explanation for Statement -1

C. Statement -1 is Flalse, Statement -2 is true

D. Statement -1 is True Statement -2 is False

Answer:

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21. Statement-1 : The percentage change in time period is 1.5%, if the length of simple pendulum increases by 3% Statement-2:Time period is directly proportional to length of pendulum

A. Statement -1 is True, Statement -2 is true., Satement -2 is a correct explanation for Statement -1

B. Statement-1 is True, Statement -2 is True , Statement -2 NOT a correct explanation for Statement -1

C. Statement -1 is Flalse, Statement -2 is true

D. Statement -1 is True Statement -2 is False

Answer:

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

A. aT/x

B. $aT + 2\pi v$

C. aT/v

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

Answer:

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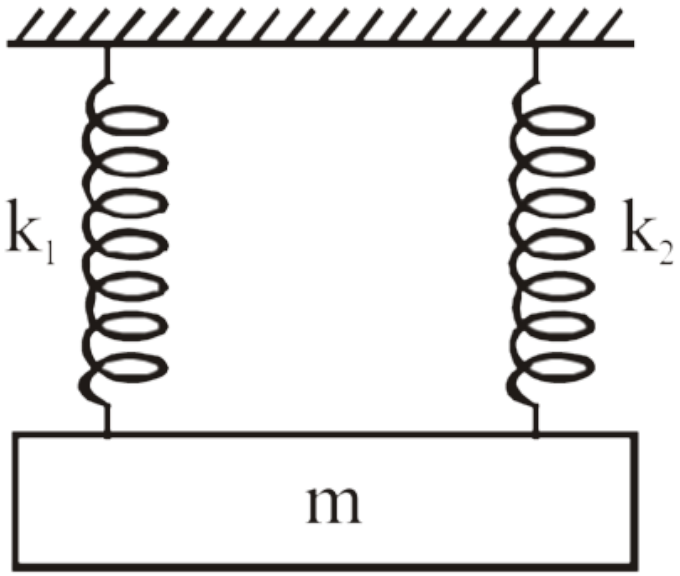
23. A mass is suspended separately by two different springs in successive order, then time periods is $t_1 \text{and} t_2$ respectively. It is connected by both

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:

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24. A rod of length l is in motion such that its ends A and B are moving along x-axis and y-axis respectively. It is given that $\frac{d\theta}{dt} = 2$ rad/sec always . P is a fixed point on the rod . Let M be the projection of P on x-axis . For the time interval in which θ changes from 0 to $\frac{\pi}{2}$, the correct statement is

A. The acceleration of M is always directed towards right

B. M executes SHM

C. M moves with constant speed

D. M moves with constant acceleration

Answer:

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25. 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 equilinrium to the end is.

A. $2\pi^2 ma^2 v^2$

B. $\pi^2 ma^2 v^2$

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

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

Answer:

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26. A mass M attached to a spring oscillates with a period of 2s. If the mass is increased by 2 kg, then the period increases by 2s. Find the initial mass M assuming that Hooke's law is obeyed.

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

B. $\frac{1}{3}$ kg

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

D. 1 kg

Answer:

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27. 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. 3^3

C. $3\sqrt{3}$

D. 2^3

Answer:

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28. Assume the earth to be perfect sphere of uniform density. If a body is dropped at one end of a tunnel dug along a diameter of the earth

(remember that inside the tunnel the force on the body is – k times the displacement from the centre, k being a constant), it (body) will

A. reach the earth's centre and stay there

B. go through the tunnel and comes out at the other end

C. oscillate simple harmonically in the tunnel

D. stay somewhere between the earth's centre and one of the ends of tunnel .

Answer:

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29. A particle undergoes simple harmonic motion having time period T. The time taken in 3/8th oscillation is

A. $\frac{3}{8}$ T

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

C. $\frac{5}{12}$T

D. $\frac{7}{12}$T

Answer:

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30. A particle is executing simple harmonic motion with amplitude A. When the ratio of its kinetic energy to the potential energy is $\frac{1}{4}$, its displacement from its mean position is

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

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

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

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

Answer:

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31. The length of a simple pendulum executing simple harmonic motion is increased by 21%. The percentage increase in the time period of the pendulum of increased lingth is.

A. 11%

B. 21%

C. 42%

D. 10%

Answer:

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32. The time period of a mass suspended from a spring is T. If the spring is cut into four equal parts and the same mass is suspended from one of the parts, then the new time period will be

A. 2T

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

C. 2

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

Answer:

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33. Two simple harmonic motions act on a particle. These harmonic motions are $x = A\cos\omega t + \delta, y = A\cos(\omega t + \alpha)$ when $\delta = \alpha + \frac{\pi}{2}$, the resulting motion is

A. a circle and the actual motion is clockwise

B. an ellipse and the actual motion is counterclock wise

C. an ellipse and the actual motion is clockwise

D. a circle and the actual motion is counter clockwise

Answer:

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34. A point mass oscillates along the x-axis according to the law $x = x_0 \cos(moegat - \pi/4). Iftheae \leq rationofthepartic \leq iswrienas$ a=A cos(omegat+delta), the .

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:

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

B. $\frac{25}{9}$

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

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

Answer:

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36. A body oscillates with a simple harmonic motion having amplitude 0.05 m. At a certain instant of time, its displacement is 0.01 m and acceleration is $1.0 m / s^2$. The period of oscillation is

A. 0.1 s

B. 0.2 s

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

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

Answer:

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37. The particle executing simple harmonic motion has a kinetic energy $k_0 \cos^2 \omega t$ The maximum value of the potential energy and the total energy are respectively

A. $K_0 / 2$ and K_0

B. $K_0 \text{and} 2K_0$

C. $K_0 \text{and} K_0$

D. $0 \text{and} 2K_0$

Answer:

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38. A simple pendulum attached to the ceiling of a stationary lift has a time period T. The distance y covered by the lift moving upwards varies with time t as $y = t^2$ where y is in metres and t in seconds. If $g = 10m/s^2$, the time period of pendulum will be

A. $\sqrt{\frac{4}{5}}T$

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

C. $\sqrt{\frac{5}{4}}T$

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

Answer:

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39. A particle moves with simple harmonic motion in a straight line. In first τs, after starting form rest it travels a destance a, and in next τs it travels 2a, in same direction, then:

A. amplitude of motion is 3a

B. time period of oscillations is 8τ

C. amplitude of motion is 4a

D. time period of oscillation is 6τ

Answer:

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40. Two simple harmonic are represented by the equation $y_1 = 0.1\sin\left(100\pi + \frac{\pi}{3}\right)$ and $y_2 = 0.1\cos\pi t.$

The phase difference of the velocity of particle 1 with respect to the velocity of particle 2 is.

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

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

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

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

Answer:

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41. Masses $M_A \text{and} M_B$ hanging from the ends of strings of lengths $L_A \text{and} L_B$ are executing simple harmonic motions. If their frequencies are $f_A = 2f_B$, then

A. $L_A = 2L_B \text{and} M_A = M_B/2$

B. $L_A = 4L_B$ regardless of masses

C. $L_A = L_B/4$ regardless of masses

D. $L_A = 2L_B \text{and} M_A = 2M_B$

Answer:

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42. In damped oscillations, the amplitude of oscillation is reduced to one-third of its initial value of $9cm$ at the end of 100 oscillations. What will be its amplitude of oscillation in cm when it completes 200 oscillations.

A. $a_0/2$

B. $a_0/4$

C. $a_0/6$

D. $a_0/9$

Answer:

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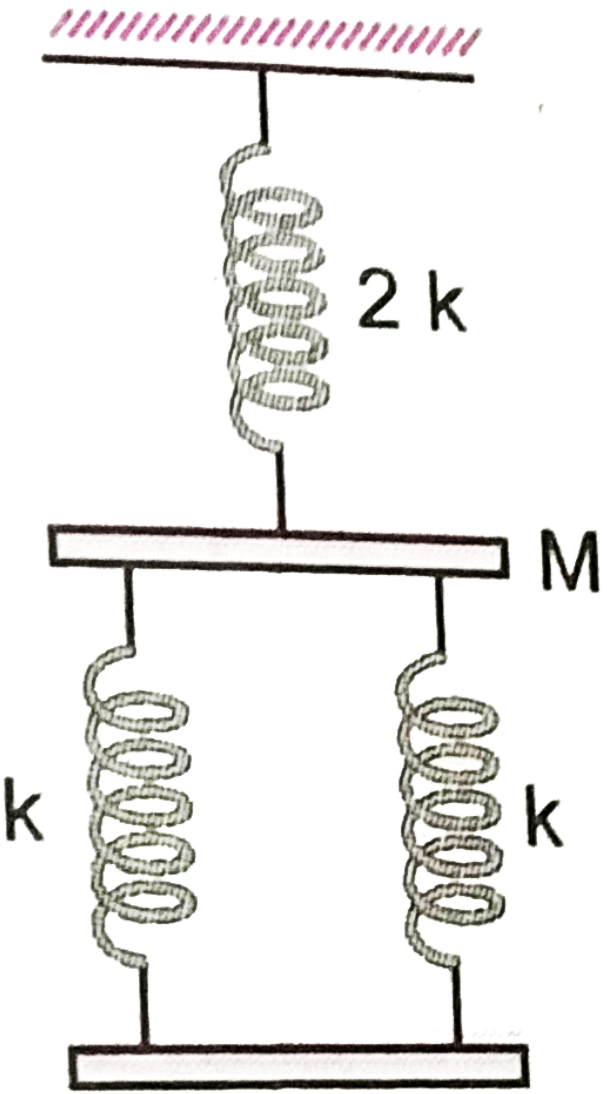
43. Three spring are connected to a mass $m(=100g)$ as shown in figure. Given $k = 2.5Nm^{-1}$. (a) What is the effecitve spring constant of the combination of spring constant of the combination of springs? (b) When

mass m oscillates, find time period of its vibration.



A. K

B. 2K

C. 4K

D. $5K/2$

Answer:

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44. A body executes simple harmonic motion. The potential energy (P.E), the kinetic energy (K.E) and energy (T.E) are measured as a function of displacement x. Which of the following staements is true?

A. K.E. is maximum when x = 0

B. T.E is zero when x = 0

C. K.E is maximum when x is maximum

D. P.E is maximum when x = 0

Answer:

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45. A simple harmonic wave having an amplitude a and time period T is represented by the equation y = $5\sin\pi(t+4)m$. Then the value of amplitude (a) in (m) and time period (T) in second are

A. a = 10 , T = 2

B. a = 5 , T = 1

C. a= 10 , T = 1

D. a= 5 , T = 2

Answer:

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46. A particle moves such that its acceleration 'a' is given by$a = -zx$ where x is the displacement from equilibrium position and z is constant. The period of oscillation is

A. $2\pi / z$

B. $2\pi / \sqrt{z}$

C. $\sqrt{2\pi / z}$

D. $2\sqrt{\pi / z}$

Answer:

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47. The displacement of an obuect attached to a spring and executing simple harmonic motion is given by $x = 2 \times 100^{-2} \cos \pi t$ metre. The time at which the maximum speed first occurs is.

A. 0.25s

B. 0.5s

C. 0.75 s

D. 0.125s

Answer:

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48. A tunnel has been dug through the centre of the earth and a ball is released in it. It executes S.H.M. with time period

A. 42 minutes

B. 1 day

C. 1 hour

D. 84.6 minutes

Answer:

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

A. 5, 10

B. 3,2

C. 4,2

D. 3,4

Answer:

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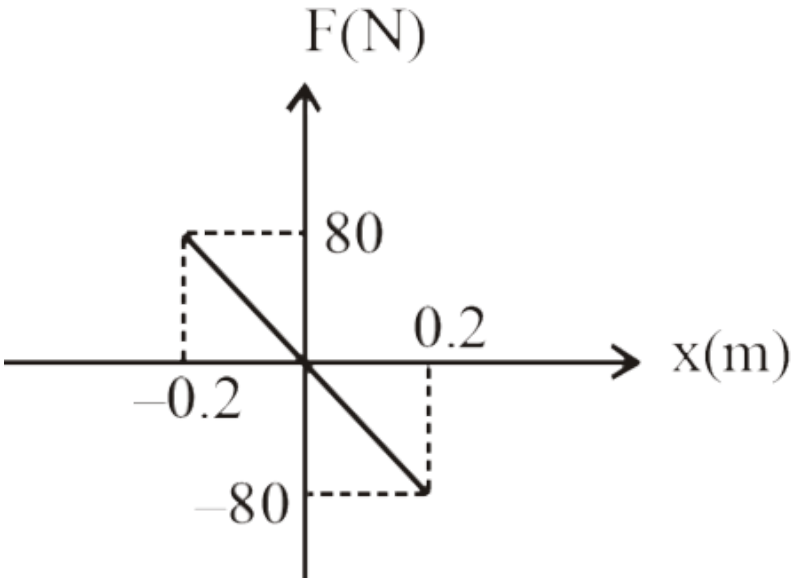
50. A body of mass 0.01 kg executes simple harmonic motion about x = 0 under the influence of a force as shown in figure. The time period of SHM is



A. 1.05 s

B. 0.52 s

C. 0.25 s

D. 0.03 s

Answer:

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51. Two oscillators are started simultaneously in same phase. After 50 oscillations of one, they get out of phase by π, that is half oscillation. The percentage difference of frequencies of the two oscillators is nearest to

A. $2\ \%$

B. $1\ \%$

C. $0.5\ \%$

D. $0.25\ \%$

Answer:

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52. The length of a second's pendulum at the surface of earth is 1 m. The length of second's pendulum at the surface of moon where g is 1/6th that at earth's surface is

A. 1/6m

B. 6m

C. 1/36 m

D. 36 m

Answer:

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53. A simple spring has length l and force constant K. It is cut into two springs of lengths $l_1 \text{and} l_2$ such that $l_1 = nl_2$ (n = an integer). The force constant of spring of length l_1 is

A. K(1+n)

B. (K/n)(1+n)

C. K

D. K/(n+1)

Answer:

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54. The displacement of a particle from its mean position (in mean is given by $y = 0.2\sin(10\pi t + 1.5\pi)\cos(10\pi t + 1.5\pi)$. The motion but not $S.H.M.$

A. periodic but not SHM

B. non-periodic

C. simple harmonic motion with period 0.1 s

D. simple harmonic motion with period 0.2 s.

Answer:

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55. A point particle if mass $0.1kg$ is executing SHM of amplitude $0.1m$. When the particle passes through the mean position, its kinetic energy is $8 \times 10^{-3} J$. Write down the equation of motion of this particle when the initial phase of oscillation is 45°.

A. $y = 0.1\sin\left(\pm 4t + \frac{\pi}{4} \right)$

B. $y = 0.2\sin\left(\pm 4t + \frac{\pi}{4} \right)$

C. $y = 0.1\sin\left(\pm 2t + \frac{\pi}{4} \right)$

D. $y = 0.2\sin\left(\pm 2t + \frac{\pi}{4} \right)$

Answer:

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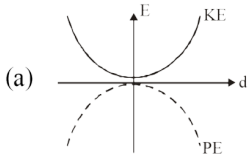
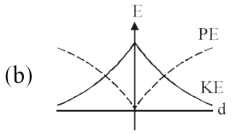
56. For a simple pendulum, a graph is plotted between itskinetic energy (KE) and potential energy (PE)against its displacement d. Which one of the following represents these correctly? (graph are schematic and not drawn to scale)

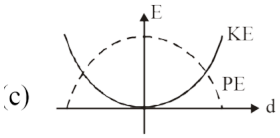
A.



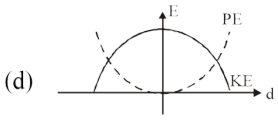
B.



C.



D.



Answer:

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57. 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:

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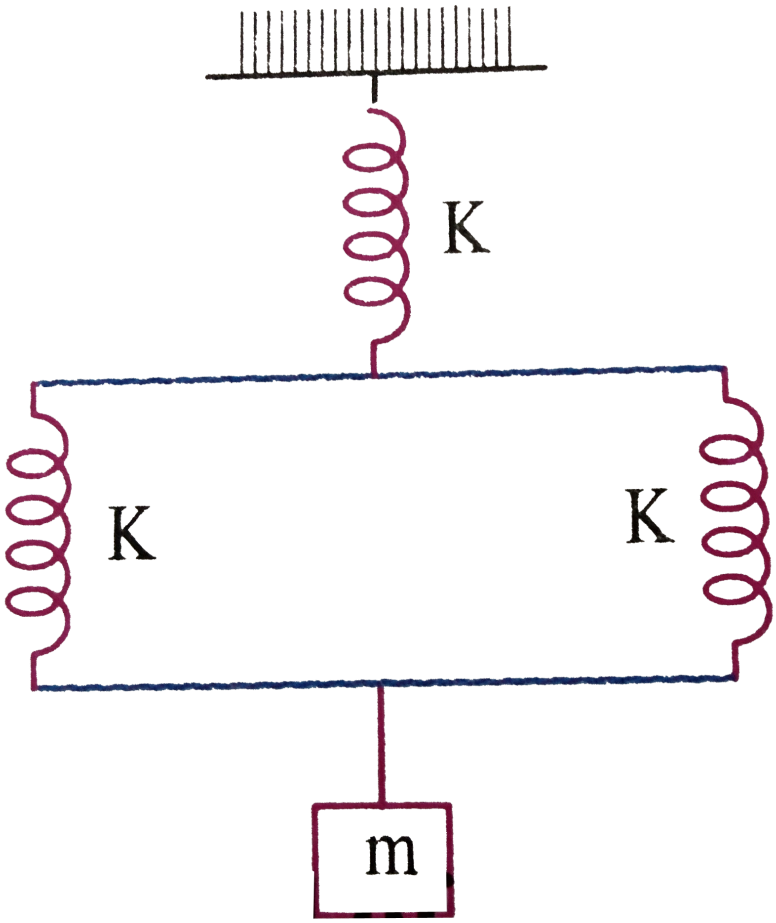
58. A body of mass m is suspended from three springs as shown in figure.

If mass m is displaced slightly then time period of oscillation is



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

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

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

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

Answer:

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59. A hollow sphere is filled with water through a small hole in it. It is then hung by a long thread and made to oscillate. As the water slowly flows out of the hole at the bottom, the period of oscillation of the sphere.

A. first increase and then decrease

B. first decrease and then increase

C. go on increasing

D. go on decreasing

Answer:

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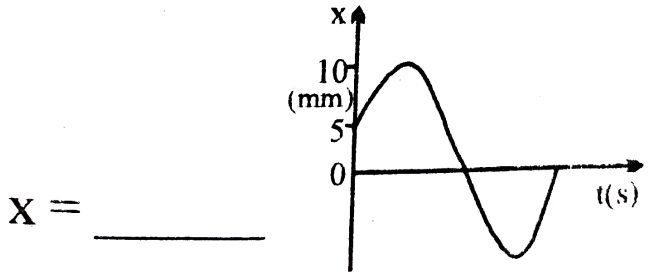
60. The figure shows the displacement-time graph of a particle executing SHM. If the time period of oscillation is $2s$, then the equation of motion is given by



X = _____

A. $x = 10\cos\pi t$

B. $x = 5\sin\left(\pi t + \frac{\pi}{3}\right)$

C. $x = 10\sin\left(\pi t + \frac{\pi}{3}\right)$

D. $x = 10\sin\left(\pi t + \frac{\pi}{6}\right)$

Answer:

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61. A coin is placed on a horizontal platform which undergoes vertical simple harmonic motion of angular frequency ω. The amplitude of oscillation is gradually increased. The coin will leave contact with the platform for the first time

A. at the mean position of the platform

B. for an amplitude of $\frac{g}{\omega^2}$

C. for an amplitude of $\frac{g^2}{\omega^2}$

D. at the highest position of the platform

Answer:

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62. The bob of a simple pendulum executm simple harmonic motion in water with a period t, while the period of oscillation of the bob is t_0 in air. Negleting frictional force of water and given that the density of the bob

is (4//3)xx1000 kg//m^(3).

What relationship between t and t_0 is true.

A. $t = t_0$

B. $t = t_0/2$

C. $t = t_0$

D. $t = 4t_0$

Answer:

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

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

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

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

Answer:

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64. Due to some force F_1 a body oscillates with period $4/5s$ and due to other force F_2 it oscillates with period $3/5s$. If both the forces acts simultaneously in same direction then new period is

A. $\frac{12}{25}$

B. $\frac{7}{5}$

C. $\frac{24}{25}$

D. $\frac{5}{7}$

Answer:

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65. A block connected to a spring oscillates vertically. A damping force F_d, acts on the block by the surrounding medium. Given as $F_d = -bV$, b is a positive constant which depends on :

A. viscosity of the medium

B. size of the block

C. shape of the block

D. All of these

Answer:

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66. A simple pendulum of length l has maximum angular displacement θ . Then maximum kinetic energy of a bob of mass m is

A. $\frac{1}{2}ml/g$

B. mg/2l

C. mgl $(1 - \cos\theta)$

D. $mgl\sin\theta / 2$

Answer:

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