PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

OSCILLATION AND SIMPLE HARMONIC MOTION

Equation Of Shm , Phase And Comparing Shm With Uniform Circular Motion

1. A boby is moving in a room with a velocity of $20m/s$ perpendicular to the two walls separated by 5 meters .There is no friction and the collision with the walls are elastic.

A. Not periodic

B. Periodic but not simple harmonic

C. Priodic and simple harmonic

D. Periodic with variable time period

Answer: B

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2. Which of the following expression does not represent SHM?

A. $A\cos\omega t$

B. $A\sin 2\omega t$

C. $A\sin\omega t + B\cos\omega t$

D. $A\sin^2\omega t$

Answer: D

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

A. a simple harmonic motion with a period $2\pi / \omega$.

B. a simple harmonic motion with a period π / ω.

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

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

Answer: D

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4. The displacement of a particle is represented by the equation $y = \sin^2 \omega t$ the motion is

A. non - periodic

B. periodic but not simple harmonic

C. simple harmonic with period $2\pi / \omega$

D. simple harmonic with period π / ω

Answer: B

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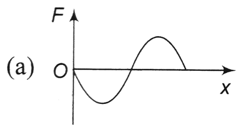
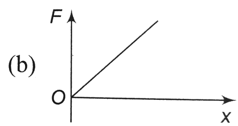
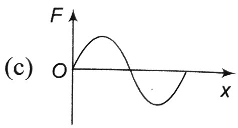
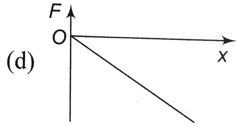
5. A particle is performing SHM. if its displacement from mean position is x, a corresponding resultant force on y is F and acceleration is a, which of the following graph is correct?

A. 

B. 

C. 

D. 

Answer: D

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

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

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

C. $1\sec$

D. $2\sec$

Answer: B

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7. At $t=0$ aparticle of mass m start moving from rest due to a force $\overrightarrow{F}=F_0\sin(\omega t)\hat{i}$:

A. Particle perform SHM about its initial position of rest

B. Particle perform SHM with initial position as extreme position with angular frequency ω

C. At any instant, distance moved by the particle equals its displacement, from the initial position

D. initial velocity of particle increases with time but after time $t = 2\pi / \omega$ it becomes constant

Answer: C

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8. Values of the acceleration A of a particle moving in simple harmonic motion as a function of its displacement x are given in the table below.

$A(mms^{-2})$	16	8	0	-8	-16
$x(mm)$	-4	-2	0	2	4

The pariod of the motion is

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

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

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

D. πs

Answer: D

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9. A particle executes simple harmonic motion between $x = -A$ and $x = +A$. The time taken for it to go from 0 to $A/2$ is T_1 and to go from $A/2$ to A is T_2. Then.

A. $T_1 < T_2$

B. $T_1 > T_2$

C. $T_1 = T_2$

D. $T_1 = 2T_2$

Answer: A

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10. The time taken by a particle performing SHM on a straight line to pass from point A to B where its velocities are same is 2 seconds .After another 2 seconds it return to B The time period of oscillation is (in seconds)

A. 2

B. 4

C. 6

D. 8

Answer: D

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11. A particle is perfroming simple harmoic motion along $x-\text{axis}$ with amplitude 4 cm and time period $1.2\,\text{sec}$.The minimum time taken by the particle to move from x=2 cm to $x= +4cm$ and back again is given by

A. 0.6 sec

B. 0.4 sec

C. 0.3 sec

D. 0.2 sec

Answer: B

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12. Two particles P and Q describe $S.H.M.$ of same amplitude a, same frequency f along the same straight line from the same mean position.

The maximum distance between the two particles is a $\sqrt{2}$, If the initial phase difference between the particles is $\frac{\pi}{N}$ then find N :

A. zero

B. 2

C. 6

D. 3

Answer: B

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13. A particle is executing $S. H. M.$ of amplitude $4cm$ and $T = 4$ sec. The time taken by it to move from positive extreme position to half the amplitude is

A. $1\,\text{sec}$

B. $1/3\,\text{sec}$

C. $2/3\,\text{sec}$

D. $\sqrt{3/2}\,\text{sec}$

Answer: C

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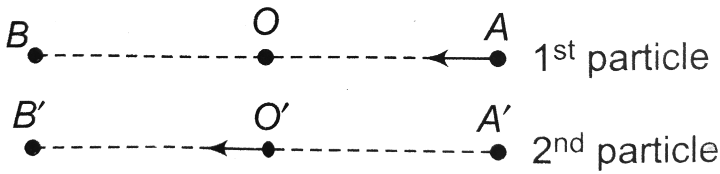
14. Two particle undergoes SHM along parallel line with the same time period (T) and equal amplitude At a particular instant , one particle is at its extereme position while the other is at its mean position .They move in the same direction .They will cross each other after a further time



A. $7/8$

B. $37/8$

C. $2/6$

D. $4/13$

Answer: B

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15. Two particles execute SHM of same amplitude of $20cm$ with same period along the same line about the same equilibrium position. If phase difference is $\pi/3$ then the maximum distance between these two will be

A. $10cm$

B. $20cm$

C. $10\sqrt{2}cm$

D. $20\sqrt{2}cm$

Answer: B

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16. A particle is moving in a circle with uniform speed its motion is

A. not periodic

B. periodic and simple harmonic

C. periodic but not simple harmonic

D. none of the above

Answer: C

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17. For a particle simple harmonic motion determine the ratio of avarage acceleration of particle from external position to equilibruim position to the maximum acceleration

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

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

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

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

Answer: B

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18. The acceleration displacement graph of a particle executing simple harmonic motion is shown in figure. The time period of simple harmonic motion is

A. $\frac{4\pi}{\sqrt{3}}s$

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

C. The given graph doesn't represent simple harmonic motion

D. information is insufficient

Answer: A

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

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

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

C. $1\sec$

D. $2\sec$

Answer: B

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20. Two simple harmonic motion are represented by equations

$y_1 = 4\sin(10t + \phi)$

$y_2 = 5\cos 10t$

What is the phase difference between their velocities ?

A. ϕ

B. $-\phi$

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

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

Answer: D

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21. A particle performs SHM with a period T and amplitude a. The mean velocity of particle over the time interval during which it travels $a/2$ from the extreme position is

A. $\frac{a}{T}$

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

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

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

Answer: C

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22. A particle performs simple hormonic motion with a period of 2 seconds. The time taken by it to cover a displacement equal to half of its amplitude from the mean position is

A. $1/2\,\text{sec}$

B. $1/3\,\text{sec}$

C. $1/4\,\text{sec}$

D. $1/6\,\text{sec}$

Answer: D

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23. A particle performs SHM on x- axis with amplitude A and time period T .The time taken by the particle to travel a distance $A/5$ starting from rest is

A. $\frac{T}{20}$

B. $\frac{T}{2\pi}\cos^{-1}\left(\frac{4}{5}\right)$

C. $\frac{T}{2\pi}\cos^{-1}\left(\frac{1}{5}\right)$

D. $\frac{T}{2\pi}\sin^{-1}\left(\frac{1}{5}\right)$

Answer: B

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24. Two particles P_1 and P_2 are performing SHM along the same line about the same meabn position , initial they are at their position exterm position. If the time period of each particle is 12 sec and the difference of their amplitude is $12cm$

then find the minimum time after which the seopration between the particle becomes $6cm$

A. $5 \sec$

B. $2 \sec$

C. $4 \sec$

D. $6 \sec$

Answer: B

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25. A particle executes SHM of amplitude A and time period T The distance travelled by the particle in the during its phasde changes from $\frac{\pi}{12}$ to $\frac{5\pi}{12}$ sin15=0.26,sin75=0.96

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

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

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

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

Answer: A

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26. The phase difference between two SHM $y_1 = 10\sin\left(10\pi t + \frac{\pi}{3}\right)$ and $y_2 = 12\sin\left(8\pi t + \frac{\pi}{4}\right)$ at $t = 0.5s$ is

A. $\frac{11\pi}{12}$

B. $\frac{13\pi}{12}$

C. π

D. $\frac{17\pi}{12}$

Answer: B

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27. If displacement x and velocity v related as $4v^2 = 25 - x^2 m$ in a SHM Then time period of given SHM is (consider SI unit)

A. π

B. 2π

C. 4π

D. 6π

Answer: C

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28. The phase difference between the displacement and acceleration of a particle executing simple harmonic motion is

A. zero

B. $\pi / 2$

C. π

D. 2π

Answer: C

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29. The displecemen-time equation of a particle execitting SHM is $x = A\sin(\omega t + \phi)$ At time $t = 0$ position of are position is $x = A/2$ and it is moving along negative $x - direction$ .Then the angle ϕ can be

A. $\left[\frac{1}{k_1} + \frac{1}{k_2}\right]^1$

B. $\left(4t - \frac{\pi}{6}\right)$

C. $\frac{1}{2\pi}\left(\frac{k_1 + k_2}{M}\right)^{1/2}$

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

Answer: D

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30. The phase difference between two particle executing SHM of the same amplitude and frequency along same straight line while pessing one another when going in apposition direction with equal displacement from then respectively straing about is is $2\pi/3$ if the prass if one particle is $\pi/6$ find the displecement at this instant amplitude is A

A. $A/3$

B. $2A/3$

C. $3A/4$

D. $A/2$

Answer: D

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31. Time period (T) and amplitude (A) are same for two particle which undergoes SHM along the same line. At one particular instant one particle is at phase $\frac{3\pi}{2}$ and the other is at zero, while moving in the same direction. Find the time at which they will cross each other

A. $4T/2$

B. $3T/8$

C. $3T/4$

D. $3T/7$

Answer: B

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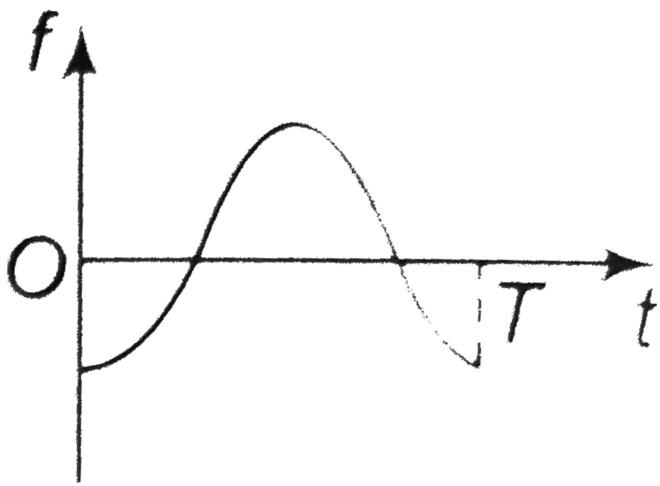
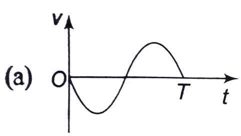
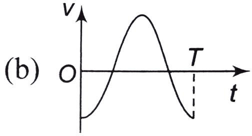
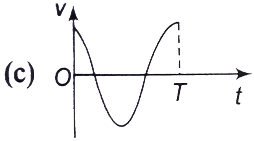
Velocity , Acceleration And Energy Of Simple Harmonic Motion

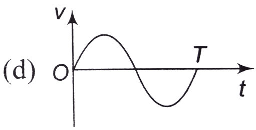
1. A body is performing simple harmonic motion with amplitude A and time period T variation of its acceleration (f) with time(t) is shown in figure If a line x velocity of the body is x which of the following graph is correct?



A. 

B. 

C. 

D. 

Answer: A

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2. The maximum acceleration of a particle in SHM is motion two lines keeping the maximum speed in the constant it is position when

A. amplitude of oscilation while frequency remain constant

B. amplatude is doubled while frequency is halved

C. amplatude is doubled while frequency is halved

D. frequency is doubled while amplitude remain constant.

Answer: C

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3. A particle is SHM is discribed by the displacement function $x(t) = a\cos(\Delta\omega + \theta)$ If the initial $(t = 0)$ position of the particle $1cm$ and its initial velocity is $\pi cm/s$ The angular frequency of the particle is $\pi rad/s$, then its amplitude is

A. $1cm$

B. $\sqrt{2}cm$

C. $2cm$

D. $2.5cm$

Answer: B

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4. Two particles P and Q describe simple harmonic motions of same period , same amplitude along the same line about the same equilibrium position O. When P and Q are on opposite sides of O at the same distance from O they have the same speed of $1.2m/s$ in the same direction, when their displacements are the same they have the same speed of $1.6m/s$ in opposite directions .The maximum velocity in m/s of either particle is

A. 2.8

B. 2.5

C. 2.4

D. 2

Answer: D

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5. A particle executes simple harmonic motion with an amplitude of $4cm$ At the mean position the velocity of tge particle is 10 earth distance of the particle from the mean position when its speed 5 point is

A. $\sqrt{3}cm$

B. $\sqrt{5}cm$

C. $21\left(\sqrt{3}\right)cm$

D. $21\left(\sqrt{5}\right)cm$

Answer: C

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6. A particle is executing SHM according to the equation $x = A\cos\omega t$. Average speed of the particle during the interval $0 \leq t \leq \frac{\pi}{6\omega}$ is

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

B. $\frac{\sqrt{3}A\omega}{4}$

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

D. $\frac{3A\omega}{\pi}(2-\sqrt{3})$`

Answer: D

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7. The KE and PE, of a particle executing SHM amplitude A will be equal when its displacement is

A. $A\sqrt{2}$

B. $A/2$

C. $A/\sqrt{2}$

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

Answer: C

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8. A verticle mass-spring system executed simple harmonic oscillation with a period $2s$ quantity of this system which simple varation with a period of $1\,\mathrm{sec}$ are

A. velocity

B. potential energy

C. phese different between acceleration and displacement

D. different between kinetic energy and potential energy.

Answer: A

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9. 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. TE is zero when $x = 0$

B. PE is maximum when $x = 0$

C. KE is maximum when $x = 0$

D. KE is maximum when x is maximum

Answer: C

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10. A particle is vibrating simple harmonically with amplitude $'a'$. The displacement of the particle when its energy is half kinetic and half potential is.

A. $a/2$

B. $a/\sqrt{2}$

C. $a/4$

D. zero

Answer: B

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11. A body is performing simple harmonic motion. Then its

A. average total energy per cycle is equal to its maximum kinetic energy.

B. average kinetic energy per cycle is equal to half of its maximum kinetic energy.

C. average total energy per cycle is equal to half of its malximum kinetic energy.

D. None of these.

Answer: B

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12. A body is executing simple harmonic motion As x displacement x its potential energy is E_1

and at a displacement y its potential energy is E_2

The potential energy E at displacement $(x+y)$

is

A. $\sqrt{E}=\sqrt{E_1}-\sqrt{E_2}$

B. $\sqrt{E}=\sqrt{E_1}+\sqrt{E_2}$

C. $E=E_1+E_2$

D. $E=E_1+E_2$

Answer: B

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

A. 0.05

B. 0.06

C. 0.01

D. None of these

Answer: B

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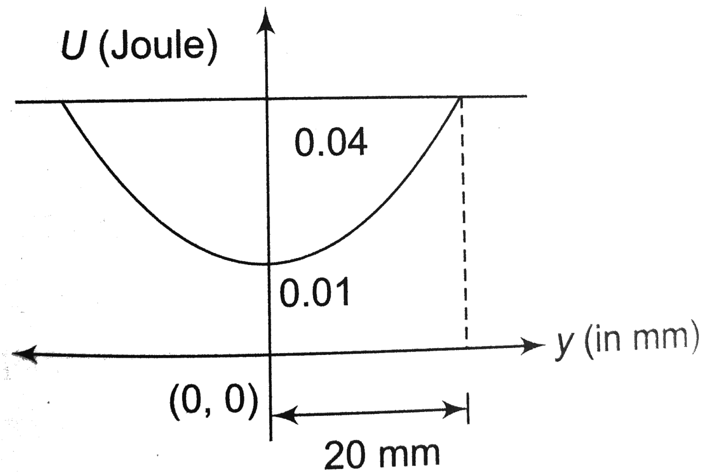
14. The veriation of potential energy of harmonic escillator is as shown in figure. The spring constant is



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

B. $150N/m$

C. $0.667 \times 10^2 N/m$

D. $3 \times 10^2 N/m$

Answer: B

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15. For a particle in $S.H.M.$ if the amplitude of displacement is a and the amplitude of velocity is v the amplitude of acceleration is

A. va

B. $\frac{v^2}{a}$

C. $\frac{v^2}{2a}$

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

Answer: B

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16. A particle is executing simple harmonic motion with an angular at a $4cm$. At the mean position the velocity of the particle is $10cm/\sec$

.The particle from the mean position when its speed becomes $2cm/s$ is

A. $\sqrt{3}cm$

B. $2\sqrt{2}cm$

C. $2\sqrt{3}cm$

D. $3\sqrt{2}cm$

Answer: C

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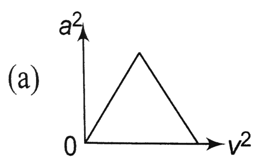
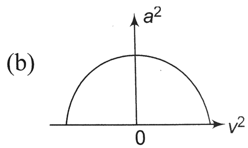
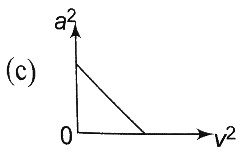
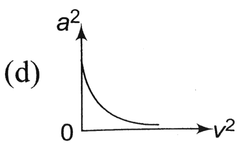
17. A particle is in a linear SHM. If acceleration and the corresponding velocity of this particle are a and v then the graph relating to these values is

A. 

B. 

C. 

D. 

Answer: C

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18. A particle executes SHM in a straight line path .The amplitude of oscillation is $2cm$. When the displacement of the particle from the mean position is $1cm$ the numerical value of acceleration is equal to the numerical value of velocity. Then find the frequency of SHM.

A. $\sqrt{3}/2\pi$

B. $3/2\pi$

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

D. $\sqrt{3}/\pi$

Answer: A

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19. The total energy of a particle, executing simple harmonic motion is.

where x is the displacement from the mean position, hence total energy is independent of x.

A. propotional to x

B. propotional to x^2

C. independent of x

D. propotional to $x^{1/2}$

Answer: C

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20. For a particle executing $S.H.M.$, the kinetic energy K is given $K = K_0 \cos^2 \omega t$. The maximum value of potential energy is:

A. K_0

B. zero

C. $K_0 / 2$

D. not abtainable

Answer: A

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

A. velocity

B. potential energy

C. phese difference between acceleration and displacement

D. difference between kinetic energy and potential energy.

Answer: B

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22. 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. TE is zero when $x = 0$

B. PE is maximum when $x = 0$

C. KE is maximum when $x = 0$

D. KE is maximum when x is maximum

Answer: C

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23. A block of mass $2kg$ executes simple harmonic motion under the reading from at a spring .The angular and the time period of motion are $0.2cm$ and 2πsec respectively Find the maximum force execute by the spring in the block.

A. $0.05N$

B. $0.002N$

C. $0.003N$

D. $0.004N$

Answer: D

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24. The velocity v of a particle of mass in moving along a straight line change within time t as $\frac{d^2v}{dt^2} = -Kv$ where K is a particle constant which of the following statement is correct?

A. The particle does not perform SHM

B. The particle perform $SHM$with time period $2\pi\sqrt{\frac{m}{k}}$

C. The particle perform $SHM$with time frequency$\frac{\sqrt{k}}{2\pi}$

D. The particle perform $SHM$with time period $\frac{2\pi}{K}$

Answer: C

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25. A $4kg$ particle is moving along the x- axis under the action of the force $F = -\left(\frac{\pi^2}{16}\right)xN$ At $t = 2\sec$ the particle passes through the origin and $t = 10\,\text{sec}$, the speed is $4\sqrt{2}m/s$ The amplitude of the motion is

A. $\dfrac{32\sqrt{2}}{\pi}m$

B. $\dfrac{16}{\pi}m$

C. $\dfrac{4}{\pi}m$

D. $\dfrac{16\sqrt{2}}{\pi}m$

Answer: A

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26. Which of the following is correct about a SHM, along a straight line?

A. Ratio of acceleration to velocity is constant.

B. Ratio of acceleration to potential energy is constant.

C. Ratio of acceleration to displacement from the mean position is constant.

D. Ratio of acceleration to kinetic energy is constant.

Answer: C

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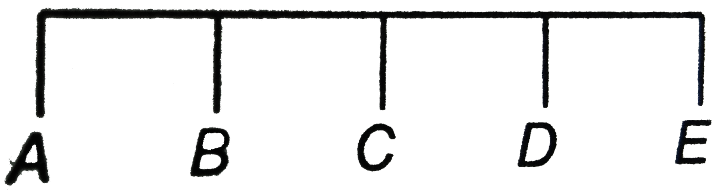
27. A body performs simple harmonic oscillations along the straight line $ABCDE$ with C as the midpoint of AE. Its kinetic energies at B and D are each one fourth of its maximum value. If $AE = 2R$, the distance between B and D is



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

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

C. $\sqrt{3}R$

D. $\sqrt{2}R$

Answer: C

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28. A particle moving on x - axis has potential energy $U = 2 - 20x + 5x^2$ joule along x - axis. The particle is relesed at $x = -3$. The maximum value of x will be (x is in meter)

A. $5m$

B. $3m$

C. $7m$

D. $8m$

Answer: C

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29. The potential energy of a particle executing SHM change from maximum to minimum in $5s$. Then the time period of SHM is:

A. $5s$

B. $10s$

C. $15s$

D. $20s$

Answer: D

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30. A particle performs SHM of amplitude A along a straight line .When it is a distance $\frac{\sqrt{3}}{2}$A from mean position its kinetic energy gets increase by on amount $\frac{1}{2}m\omega^2A^2$ due to an implusive force. Then its new amplitude because

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

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

C. A

D. $\sqrt{2}A$

Answer: C

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31. A particle of mass $10gm$ is placed in a potential field given by $V = (50x^2 + 100)J/kg$. The frequency of oscilltion in $cyc \leq /\sec$ is

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

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

C. $\frac{100}{\pi}$

D. $\frac{50}{\pi}$

Answer: B

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32. Which of the following is greater in SHM (assuming potential energy $= 0$ at mean position)?

A. Average kinetic energy with respect to space

B. Average potential energy with respect to space

C. Average kinetic energy with respect to time

D. Average potential energy with respect to time

Answer: A

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33. The total mechanical energy of a particle executing simple harmonic motion is E when the displacement is half the amplitude of its kinetic energy will be

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

B. E

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

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

Answer: A

Watch Video Solution

34. A particle is executing linear SHM. The average kinetic energy and avearge potential energy over a period of oscillation are K_{av} and U_{av} Then

A. $K_{av} = \frac{U_{av}}{2}$

B. $U_{av} = \frac{K_{av}}{2}$

C. $K_{av} = U_{av}$

D. $U_{av} = \dfrac{K_{av}}{3}$

Answer: C

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35. A linear harmonic oscillator of force constant $2 \times 106 Nm^{-1}$ and amplitude $0.01m$ has a total mechanical energy $160J$. Among the followinhg statement , which are correct?

i Maximum $PE$is $100J$

ii Maximum $KE$is $100J$

iii Maximum PE is $160J$

iv Maximum PE is zero

A. Both (i) and (iv)

B. Both (ii) and (iii)

C. Both (i) and (ii)

D. Both (ii) and (iv)

Answer: B

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36. A body is executing SHM under action of the a force of whose maximum is $50N$. magnitude of force acting on the particle at the time when its energy is half kineic energy and half potential is (Assume potential energy to be zero at mean position).

A. $12.5\sqrt{2}N$

B. $12.5N$

C. $25N$

D. $25\sqrt{2}N$

Answer: D

Watch Video Solution

37. A particle of m is executing SHMabout the origin on x- axis frequencxy $\sqrt{\frac{ka}{\pi m}}$, where k is a constant and a is the amplitude Find its potential energy if x is the displecement at time t:

A. kax^2

B. ka^2x

C. $2\pi kax^2$

D. $2\pi kx^2$

Answer: C

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38. A particle is exeuting SHM. At a point $x = A/3$, kinetic energy of the particle of the particle is K, where A is the particle At a point $x = 2A/3$, kinetic energy of the particle will be:

A. $2K$

B. $K\sqrt{2}$

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

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

Answer: C

Watch Video Solution

39. The mass of particle is $1kg$ it is moving along x- axis The period of its small oscilltion is $\frac{\pi}{2}$. Find the its potential energy:

A. $-4\sin 2x$

B. $-16\sin x$

C. $-16\cos x$

D. $-4\cos 2x$

Answer: C

Watch Video Solution

40. The frequency of oscilation is $\left(\frac{10}{\pi}\right)$ (in Hz) of a particle of mass $0.1kg$ which executes SHM is $0.2J$ at position $x = 0.02m$. The potential energy is zero at mean position Find the amplitude of osclllation (in meter)`:

A. $\dfrac{1}{2\sqrt{10}}$

B. $\dfrac{1}{\sqrt{10}}$

C. $\sqrt{10}$

D. $2\sqrt{10}$

Answer: A

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Spring Particle System

1. If a spring having frequency f is taken on moon (having) $g' = g/6$ it will have a frequency of

A. $6f$

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

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

D. $3f$

Answer: D

Watch Video Solution

2. An object is attached to the bottom of a light verticle spring and set vibrating The maximum speed of the object is $15cm/\sec$ and the time in centimeters is

A. 3.0

B. 2.0

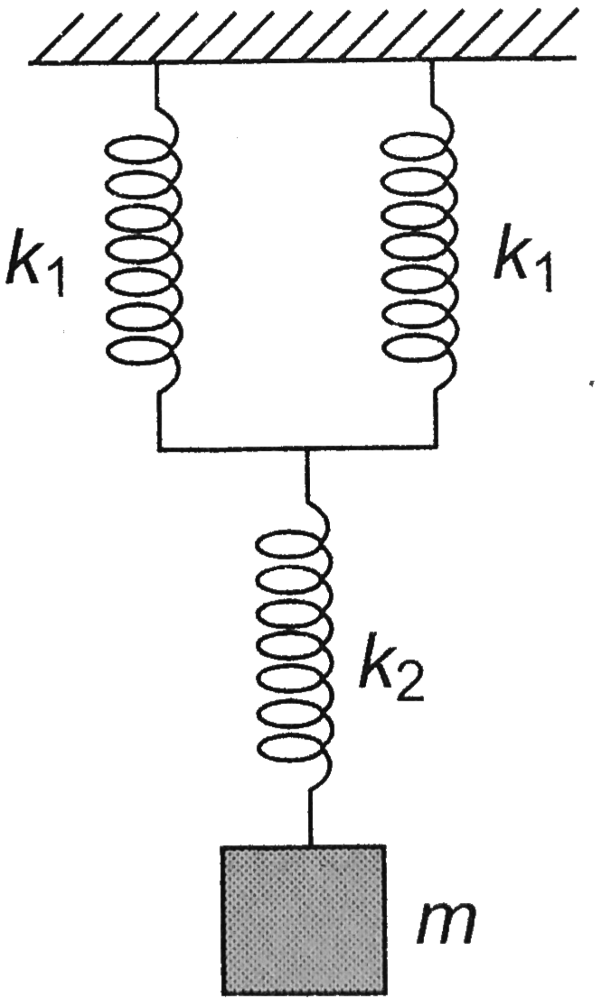
C. 1.5

D. 1.0

Answer: C

Watch Video Solution

3. What will be the force constant of the spring system shown in figure?



A. $\left[\frac{1}{k_1}+\frac{1}{k_2}\right]$

B. $\left[\frac{1}{2k_1}+\frac{1}{k_2}\right]^{-1}$

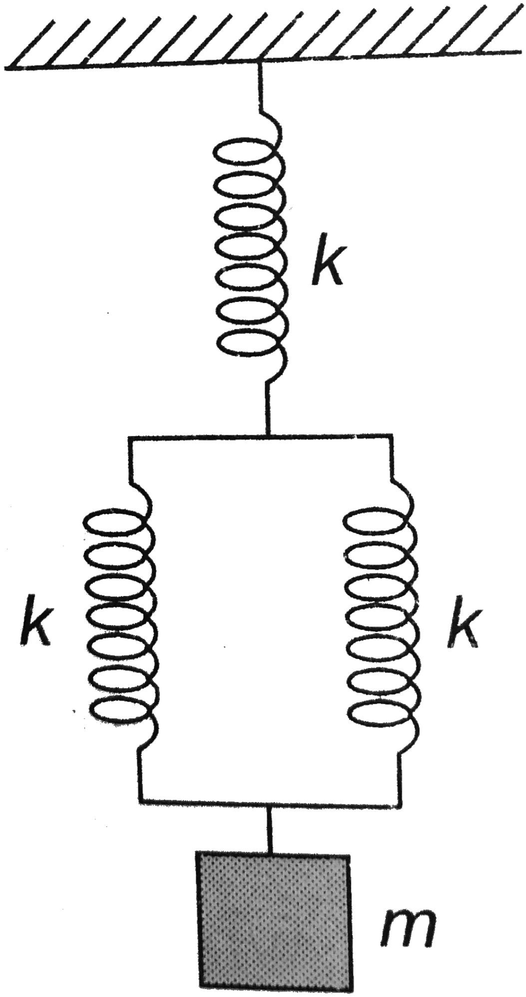
C. $\left[\frac{1}{k_1}+\frac{1}{k_2}\right]^{-1}$

D. $\left[\frac{1}{2k_1}+\frac{1}{k_2}\right]$

Answer: B

Watch Video Solution

4. What will be the period of the displacement body of mass m?



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

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

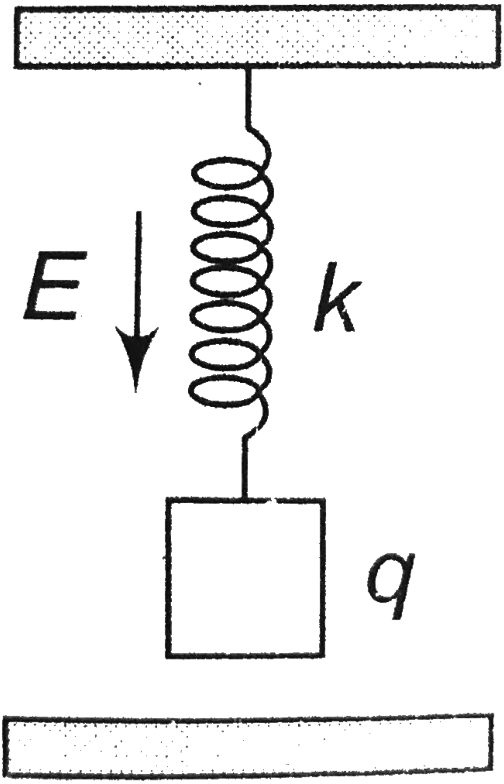
C. $2\pi\sqrt{\frac{3m}{2K}}$

D. $\pi\sqrt{\frac{3m}{K}}$

Answer: C

Watch Video Solution

5. Time period of a block when suspended from the upper plate of a parallel plate capacitor by a spring of stiffness k is T, when block is uncharged. If a charge g is given to the block then new time period of oscillation will be



A. T

B. $> T$

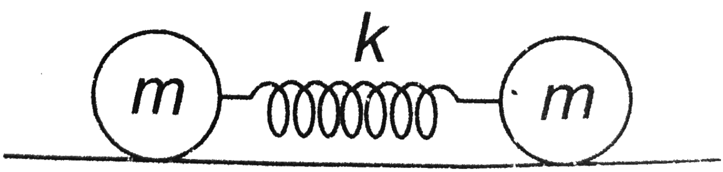
C. $< T$

D. $\geq T$

Answer: A

Watch Video Solution

6. Two identical particle each of mass m are inter connects by a light spring of stiffness k ,the time period for small oscillation is equal to



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

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

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

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

Answer: D

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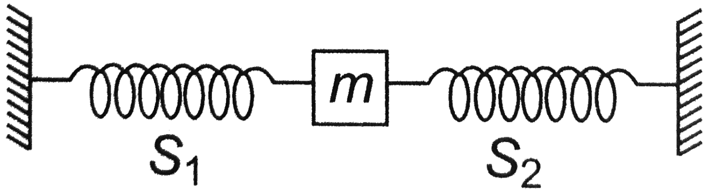
7. In figure S_1 and S_1 are identical springs. The oscillation frequency of the mass m is f. if one spring is removed, the frequency will become



A. f

B. $2f$

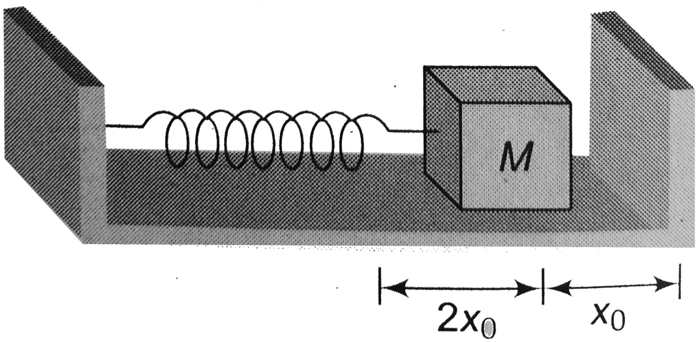
C. $f\sqrt{2}$

D. $f/\sqrt{2}$

Answer: D

Watch Video Solution

8. One end of a spring of force constant k is fixed to a vertical wall and the other to a block of mass m resting on a smooth horizontal surface There is another and wall at a distance x_0 from the block The spring is then compressed by $2x_0$ and released The time taken to at the wall is



A. $\frac{1}{6}\pi\sqrt{\frac{k}{m}}$

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

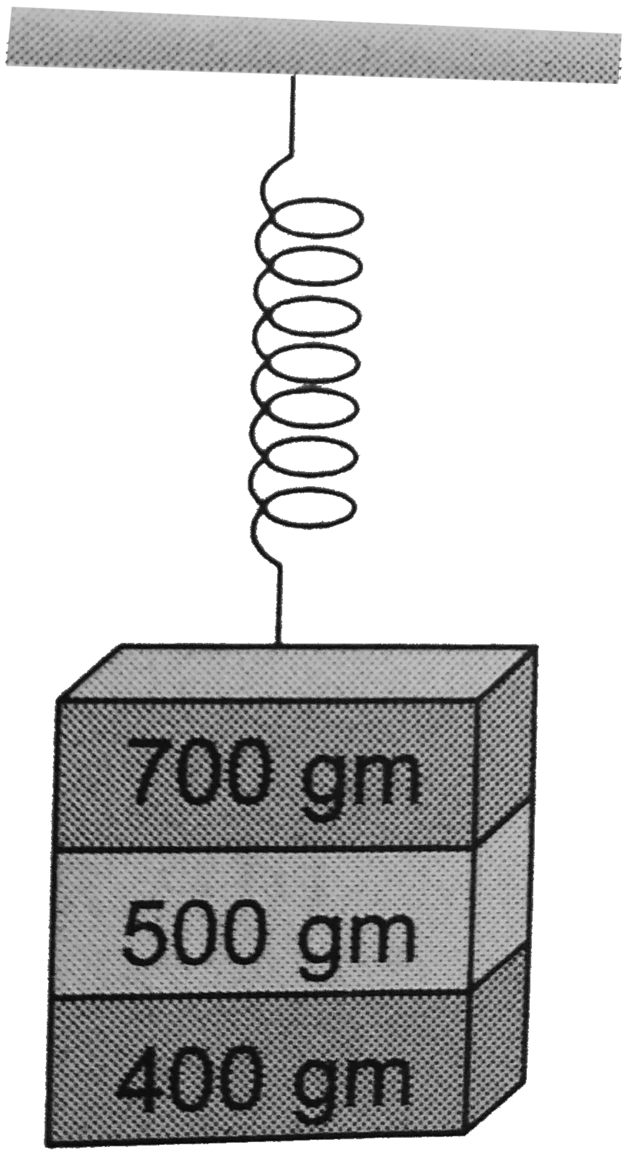
C. $\frac{2\pi}{3}\sqrt{\frac{m}{k}}$

D. $\frac{\pi}{4}\sqrt{\frac{k}{m}}$

Answer: C

Watch Video Solution

9. Three masses $700g$ and $500g$ and $400g$ are suspended at the end of a spring as shown and are in equilibrium. When the $700g$ mass is removed the system oscillates with a period of 3 second. when the $500gm$ mass is also removed it will oscillates with a period of



A. $1s$

B. $2s$

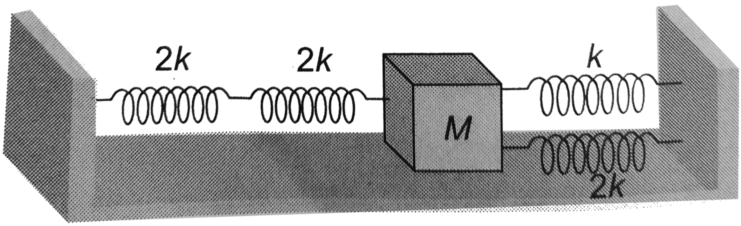
C. $3s$

D. $\sqrt{\frac{12}{5}}s$

Answer: B

Watch Video Solution

10. Four massless spring whose force constant are $2k$, $2k$, k and $2k$ respectively are attached to a mass M kept on a frictions plate (as shown in figure) if the mass M is displaced in the horizontal direction then the frequency of oscillation of the system is



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

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

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

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

Answer: B

Watch Video Solution

11. A particle at the end of a spring executes S.H,M with a period $t_1$while the corresponding period for another spring is t_2 . If the period of oscillation with two spring in series is T then

A. $T = t_1 + t_2$

B. $T^2 = t_1^2 + t_2^2$

C. $\frac{1}{T} = \frac{1}{t_1} + \frac{1}{t_2}$

D. $\frac{1}{T^2} = \frac{1}{t_1^2} + \frac{1}{t_2^2}$

Answer: B

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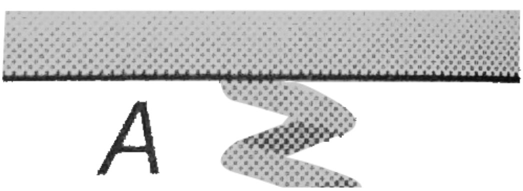
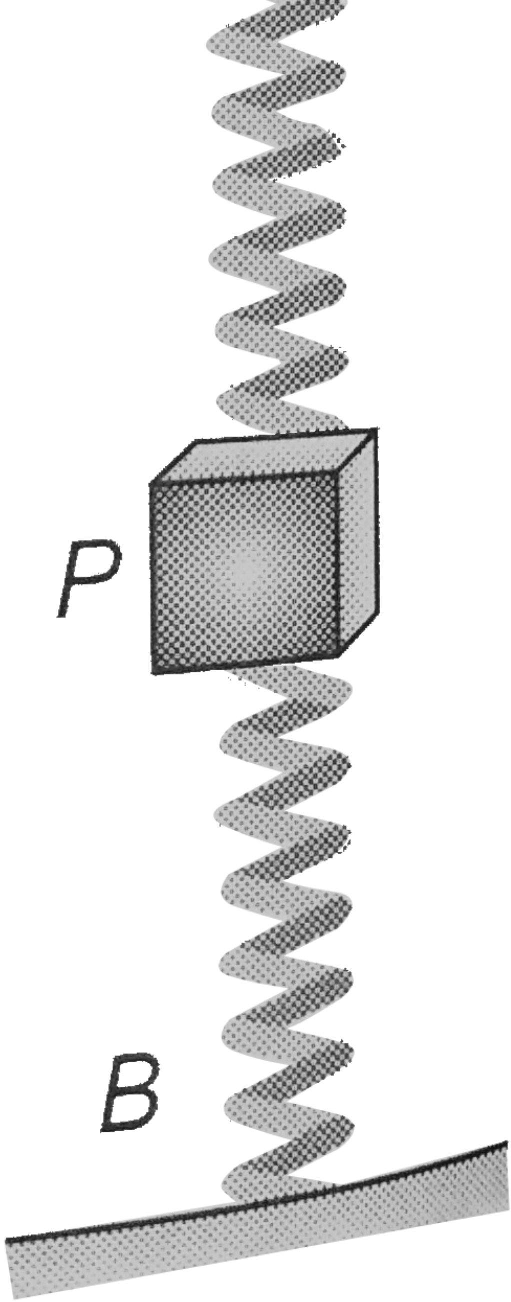
12. Two identical spring are attached to a small block P The other ends of the springs are fixed at A and B. when P is equilibrium the extension of top spring is $20cm$ and extension of bottom spring is $10cm$ The period at small vertical oscillation of p about its equilibrium position is (use $g = 9.8m/s^2$)




P
B

A. $\frac{2\pi}{7}\text{sec}$

B. $\frac{\pi}{7}\text{sec}$

C. $\frac{2\pi}{5}\text{sec}$

D. none of these

Answer: B

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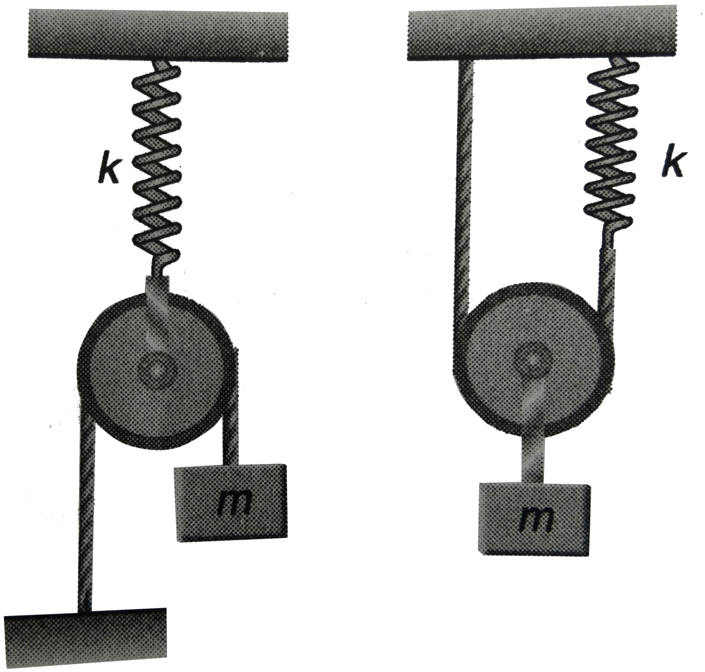
13. Figure shows a system consisting of a massless pulley, a spring of force constant k and a block of mass m. If the block is slightly displaced vertically down from its equilibrium and released, find the period of its vertical oscillation in cases (a) and (b).



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

B. $\pi\sqrt{\frac{m}{4K}}$

C. $\pi\sqrt{\frac{m}{K}}$

D. $4\pi\sqrt{\frac{m}{K}}$

Answer: D

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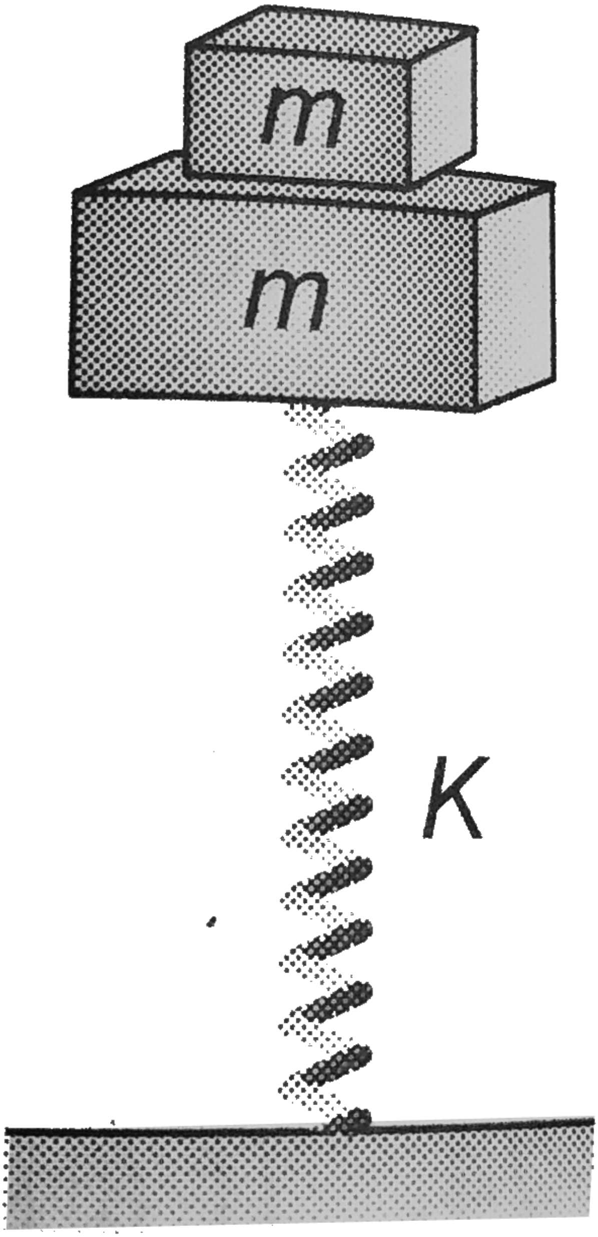
14. A block of mass m is at rest on an another block of same mass as shown in figure lower block is attached to the spring than the maximum amplitude of motion so that both the block will remain in contact is



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

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

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

D. $\frac{3mg}{2k}$

Answer: C

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15. Two particles (A) and (B) of equal masses are suspended from two massless spring of spring of spring constant k_1 and k_2, respectively, the ratio of amplitude of (A) and (B) is.

A. $\frac{K_1}{K_2}$

B. $\frac{K_2}{K_1}$

C. $\sqrt{\frac{K_1}{K_2}}$

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

Answer: D

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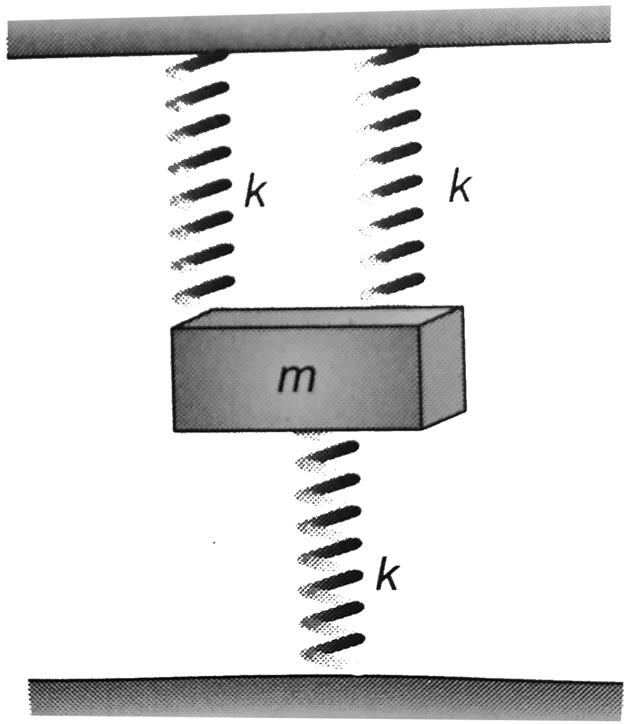
16. In the figure all spring are identical having spring constant k and mass m each .The block hav also mass m .The frequency of oscillation of the block is



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

B. $\frac{1}{2\pi}\sqrt{\frac{3k}{2m}}$

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

D. None of these

Answer: B

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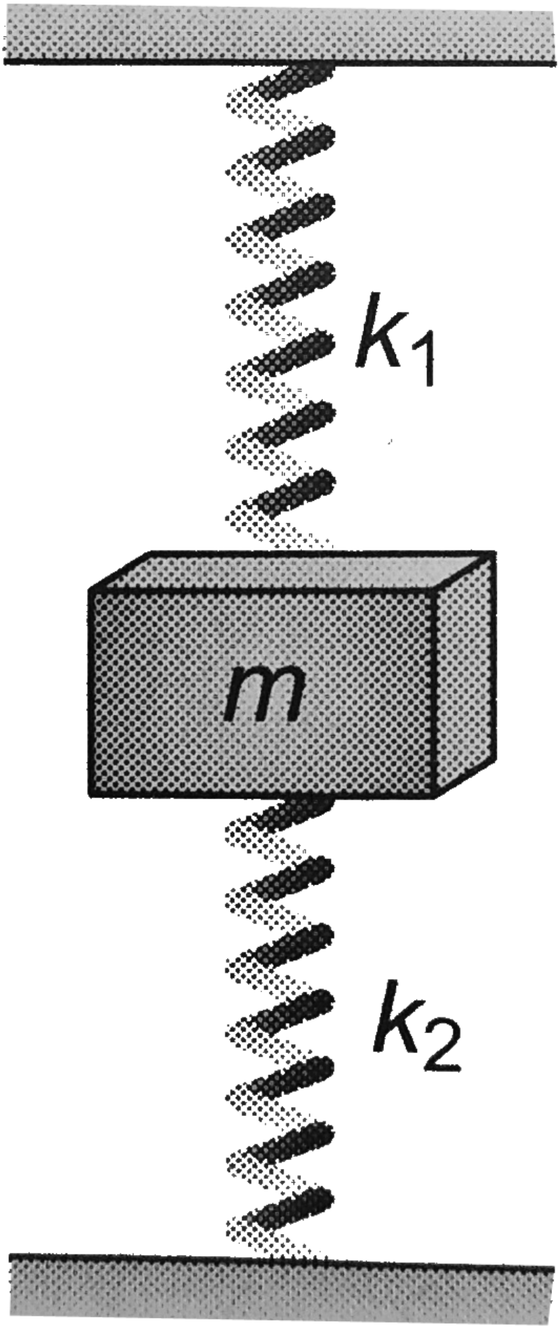
17. In the figure shown a block of masss m is atteched at ends of two spring The other ends of the spring are fixed The mass m is released in the vertical plane when the spring are released The velocity of the block is maximum when



k1
m
k2

A. k_1 is compressed and k_2 is elongated

B. k_1 is elongated and k_2 is compressed

C. k_1 and k_2 both are compressed

D. k_1 and k_2 both are elongated.

Answer: B

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18. A force of $6.4N$ stretched a vertical spring by $0.1m$ .The mass that must be suspended from the spring so that it oscillates with a time period of $\pi / 4$ second

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

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

C. $1 kg$

D. $10 kg$

Answer: C

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19. A system is shown in the figure. The force The time period for small oscilations of the two blocks will be

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

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

C. $2\pi\sqrt{\frac{3m}{4K}}$

D. $2\pi\sqrt{\frac{3m}{8K}}$

Answer: C

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20. A block of mass m length force a verical of spring constant k If the block is polled down by a distance of $2mg / k$ from its equilibrium position and released for the subsequent in the spring to maximum compressed in it mg / k

A. 2

B. 3

C. 4

D. 1

Answer: A

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

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

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

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

Answer: C

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22. A spring of spring constant K is cut equal parts of which t part are places in particle and connected will mass m shown in figure The time period of oscilation motion of mass m is

A. $T = 2\pi\sqrt{\frac{m}{nrk}}$

B. $T=2\pi\sqrt{\frac{nrm}{K}}$

C. $T=2\pi\sqrt{\frac{rm}{nK}}$

D. $T=2\pi\sqrt{\frac{nm}{rK}}$

Answer: A

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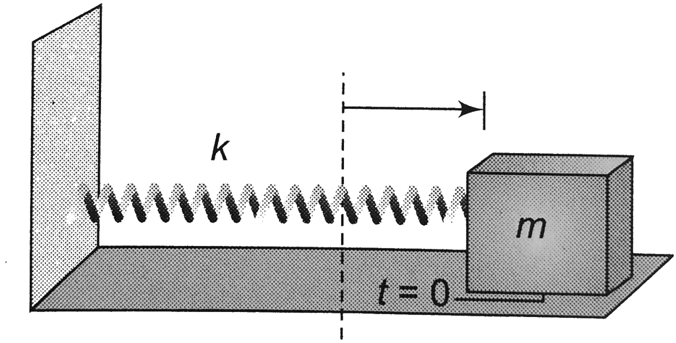
23. In a horizontal spring - mass m is released after being displaced toward right by same distance $t=0$ an a frictionless surface The phase angle of motion in ratio when it is first time passing through equlibrium possition is equal to



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

B. π

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

D. 0

Answer: B

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24. In the previous question, the amplitude of the oscillation is

A. $10\sqrt{2}cm$

B. $15\sqrt{2}cm$

C. $15cm$

D. $20cm$

Answer: C

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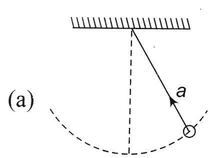
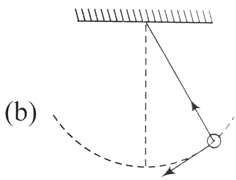
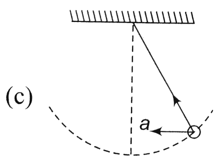
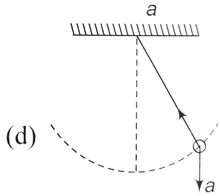
Simple Pendulum And Different Cases Of Shm

1. A simple pendulum is oscillating without damping, When the displacement of the bob is less than maximum, its acceleration vector $\vec{a}$ is correctly show in:

A. 

B. 

C. 



D.

Answer: C

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2. A simple pendulum is medder of a body which is bellow sphere containing mercury suspended by means of a wire if a total mercury is dramed off period of pendulum will

A. remain unchanged

B. increase

C. decrease

D. become erratic

Answer: B

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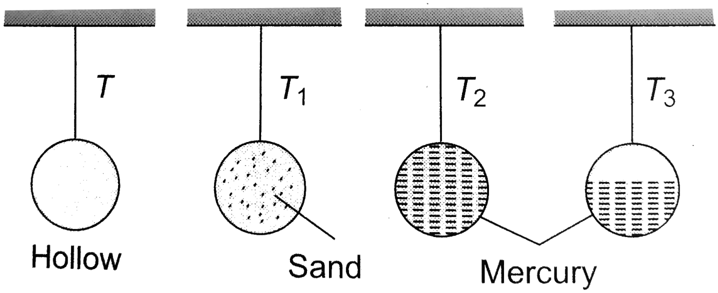
3. The time period of a simple pendulum whose bob is a hollow sphere is T. The period is T_1 where the bob is filled with sand, T_2 where it is filled with mercury and T_3 when it is half filled with mercury Which of the following is true?



A. $T = T_1 = T_2 > T_3$

B. $T_1 = T_1 = T_3 > T$

C. $T > T_3 > T_1 = T_2$

D. $T = T_1 = T_2 < T_3$

Answer: D

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4. A pendulum has time period T is air when it is made to oscillates in water it acquired a time period $T = \sqrt{27}$ The density of the pendulum bob is equal to (density) of water $= 1)$

A. $\sqrt{2}$

B. 2

C. $2\sqrt{2}$

D. None of these

Answer: B

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5. A sphere of catius r is kept on a concave of mirror radius of curation R. The arrangement a kept on a horizontal tavke (the surface of concave mirror is fricationless and sliding not rolling). If the sphere is displaced from its equilibrium position and left, then it executes $S.h.M.$ The period of oscillation will be

A. $2\pi\sqrt{\left(\frac{(R-r)1.4}{4}\right)}$

B. $2\pi\sqrt{\left(\frac{R-r}{g}\right)}$

C. $2\pi\sqrt{\left(\frac{rR}{a}\right)}$

D. $2\pi\sqrt{\left(\frac{R}{gr}\right)}$

Answer: B

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6. Two simple pendulum of length $5m$ and $20m$ respectively are given small displacement in time direction at the same time. They will again in the plane when the pendulum of shorter length has completed oscillation.

A. 5

B. 1

C. 2

D. 3

Answer: C

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

A. $2\pi\sqrt{\frac{1}{g\cos\alpha}}$

B. $\pi\sqrt{\frac{1}{g\cos\alpha}}$

C. $\frac{1}{2\pi}\sqrt{\frac{1}{g\cos\alpha}}$

D. $\frac{1}{\pi}\sqrt{\frac{1}{2g\cos\alpha}}$

Answer: A

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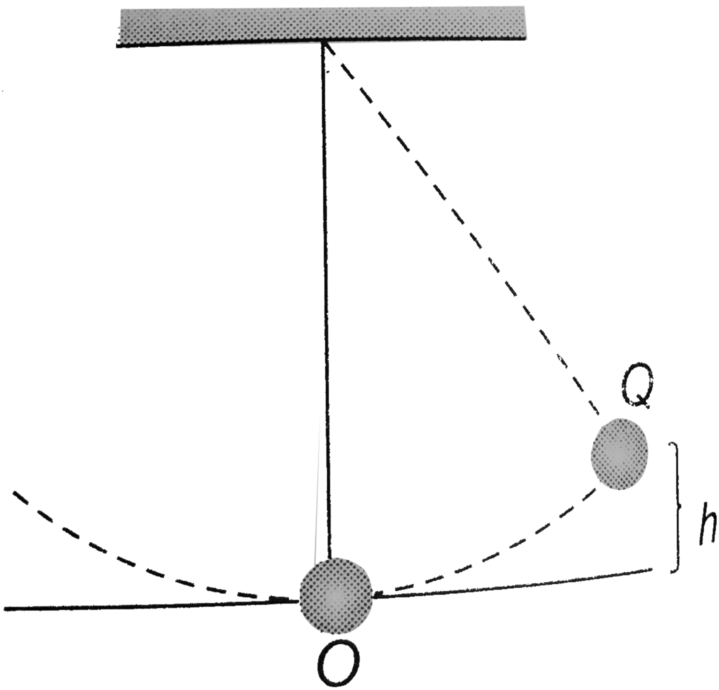
8. The bob of a simple pendulum it displaced position O to a equilibrium position Q which is at height it above O and the bob to then mass released Assuming the mass of the bob to be m

and 2.0 sec of oscillation to be string when the

bob passes through O is



A. $m\left(g+\pi\sqrt{2gh}\right)$

B. $m\left(g+\pi\sqrt{\pi^2 gh}\right)$

C. $m\left(g+\sqrt{\frac{\pi^2}{2}gh}\right)$

D. $m\left(g+\sqrt{\frac{\pi^2}{3}gh}\right.$

Answer: A

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9. Two simple pandulum whose lengths are $100cm$ and $121cm$ are suspended side by side. Then bobs are pulled together and then released. After have minimum oscillation of the length pendulum will be two be in phase again. ?

A. 11

B. 10

C. 21

D. 20

Answer: B

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10. Two pandulums have time period T and $\frac{5T}{4}$. They $S.H.M.$ at the same time from after the bigger pendulum has camplates one oscillation ?

A. 45°

B. 90°

C. 60°

D. 30°

Answer: B

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11. Two simple pendulum first of bob mass M_1 and length L_1 second of bob mass M_2 and length $L_2 M_1 = M_2$ and L_1 = 2L_(2)`. if these vibrational energy of both is same which is correct?

A. Amplitude of B grater than A

B. Amplitude of B smaller than A

C. Amplitude will be same

D. None of these

Answer: B

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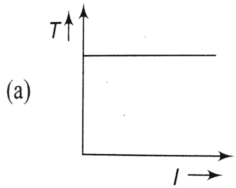
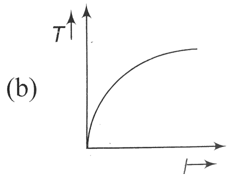
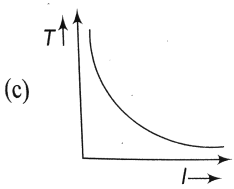
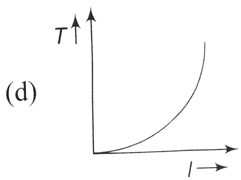
12. In case of a simple pendulum, time period versus length is depicted by

A. 

B. 

C. 

D. 

Answer: B

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13. A U tube pf uniform born of cross sectional area A has been set up vertically with open ends facing up Now mgm of a liquid of density d is poured into it. The column of liquid in this tube will oscillation with a period T such that

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

B. $T = 2\pi\sqrt{\frac{MA}{gd}}$

C. $T = 2\pi\sqrt{\frac{M}{gdA}}$

D. $T = 2\pi\sqrt{\frac{M}{2Adg}}$

Answer: D

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14. A horizontal platform with an angular placed on it is executing $S.H.M.$ in the vertical direction .The amplitude of oscillation is $4.0 \times 10^{-3}m$. What must be the least period of there oscillation so that the object is not stretched from the platform ? (Taking $g = 10m/s^2$)

A. $\frac{\pi}{25}\sec$

B. $\frac{\pi}{18}$ sec

C. $\frac{\pi}{14}$ sec

D. $\frac{\pi}{20}$ sec

Answer: A

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15. The metallic bob of a simple pendulum has the relative density ρ. The time period of this pendulum is T. If the metallic bob is immersed in water ,then the new time period is given by

A. $T\frac{\rho-1}{\rho}$

B. $T\frac{\rho}{\rho-1}$

C. $T\sqrt{\frac{\rho-1}{\rho}}$

D. $T\sqrt{\frac{\rho}{\rho-1}}$

Answer: D

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16. A solid cube of side a and density ρ_0 floats on the surface of a liquid of density ρ. If the cube is slightly pushed downward, then it oscillates simple harmonically with a period of

A. $2\pi\sqrt{\frac{\sigma a}{\rho g}}$

B. $2\pi\sqrt{\frac{\rho a}{\sigma g}}$

C. $2\pi\sqrt{\frac{\rho g}{\sigma a}}$

D. $2\pi\sqrt{\frac{\sigma a}{\rho g}}$

Answer: A

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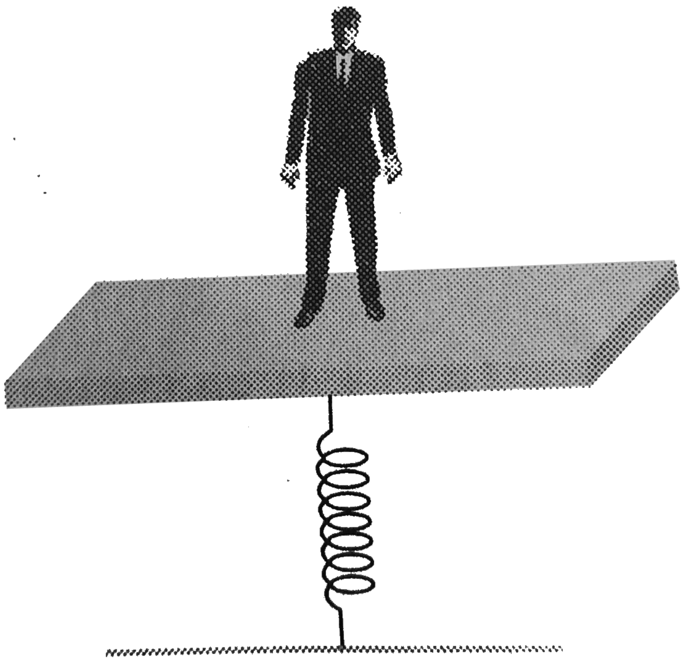
17. A man weighing $60kg$ stands on the horizontal platform of a spring balance. The platform starts executing simple harmonic motion of amplitude $0.1m$ and frequency $\frac{2}{\pi}$Hz. Which of the following statement is correct ?



A. The spring balance reads the weight of man as $60kg$

B. The spring balance reading fluctuates between $60kg$ and $70kg$

C. The spring balance reading fluctuates bettween $50kg$ and $60kg$

D. The spring balance reading fluctuates between $50kg$ and $70kg$

Answer: D

Watch Video Solution

18. A simple pendulum hung from the calling of a track moving at constant speed has a period T it the train start acceleration or decelerating then what be the effect on time period of pendulum ?

A. Decreases only when train accelerates

B. Decreases only when train decalerates

C. Decreases in both cases

D. Increases in both cases

Answer: C

Watch Video Solution

19. Two simple pendulum of length $1m$ and $16m$ respectively are both given small displacement in the same direction of the same instant. They will be phase after one shorter pendulum has complated a oscillations. The value of n is

A. $1/3$

B. $2/3$

C. 1

D. $4/3$

Answer: D

Watch Video Solution

20. Two pendulum of different angle are in pgase at mean position at a cartain The minimum and after which they will be again in phase is $5T/4$ where in the period of shaorter pendulum find the ratio length of the two pendulum

A. $1:16$

B. $1:4$

C. $1:2$

D. $1:25$

Answer: D

Watch Video Solution

21. Two pandulum start oscillation in the same direction at a same time from the same mean position time period are respectively $2s$ and $1.5s$. The phase difference between them, when the smaller pendulum is complated vibration, will be

A. $\pi / 4$

B. $\pi / 2$

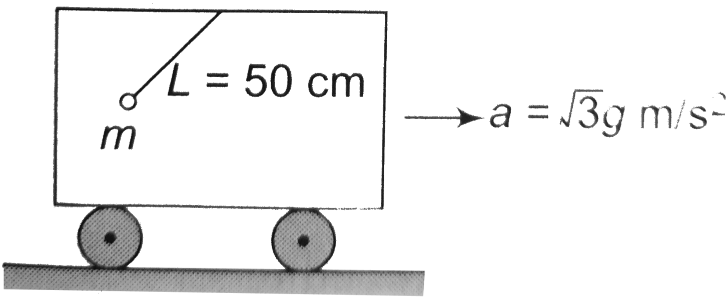
C. $2\pi / 3$

D. $3\pi / 2$

Answer: B

Watch Video Solution

22. A simple pendulum $50cm$ long is suspended from the roof of a acceleration in the horizontal direction with constant acceleration $\sqrt{3}gm / s^{-1}$. The period of small oscillations of the pendulum about its equilibrium position is $\left(g = \pi^2 m / s^2\right)$



ltbRgt

A. 1.0 sec

B. 1.25 sec

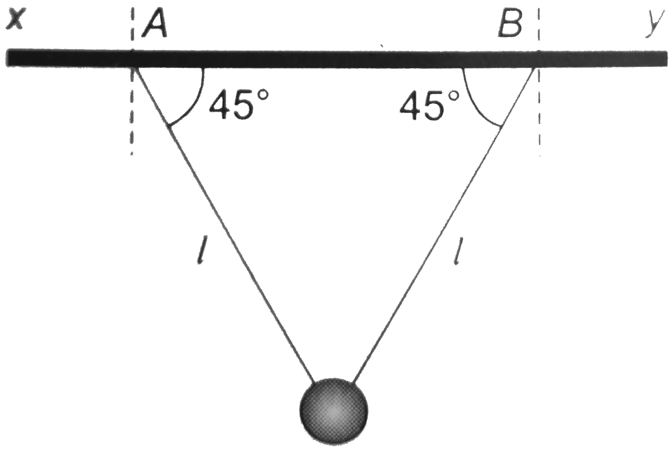
C. 1.53 sec

D. 1.68 sec

Answer: A

Watch Video Solution

23. Two light strings, each of length l are fixed at points A and$B$ on a fixed horizontal and xy A small are making angle 45° with the bob if the bob is displaced normal to the plane of the string and released then period of the resulting small oscillation will be



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

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

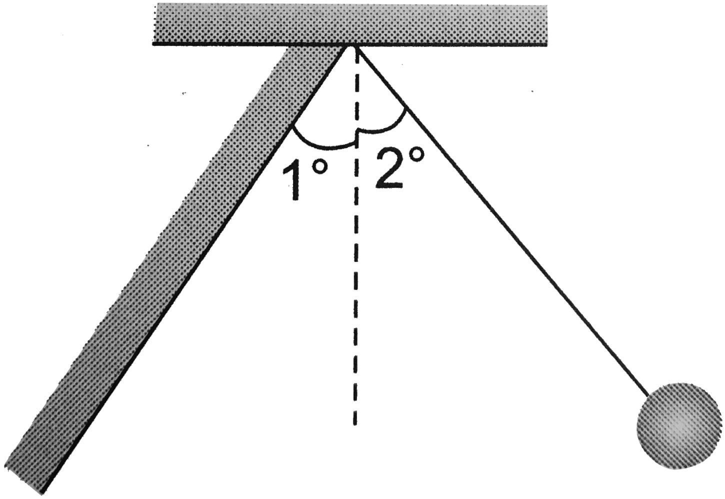
C. $2\pi\sqrt{\frac{l}{g}}$

D. $2\pi\sqrt{\frac{1}{\sqrt{2}g}}$

Answer: D

Watch Video Solution

24. A simple pendulum of length $1m$ is allowed to oscillate with amplitude 2°. it collides at T to the vertical its time period will be (use $g = \pi^2$)



A. $2/3\,\mathrm{sec}$

B. $4/3\,\mathrm{sec}$

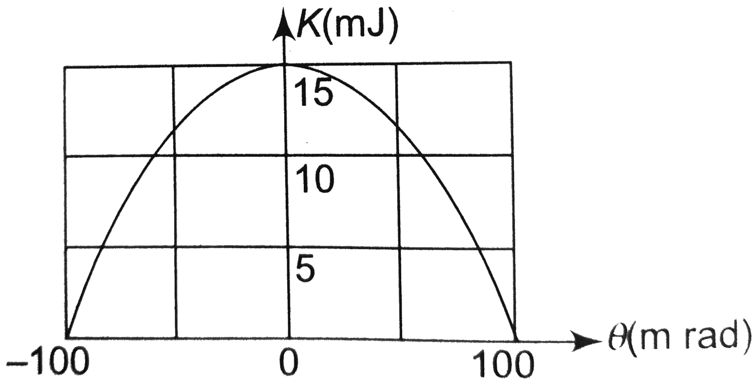
C. $2\,\mathrm{sec}$

D. none of these

Answer: B

Watch Video Solution

25. Figure shown the kinetic energy K of a pendulum versus. its angle θ from the verticle. The pendulum bob has mass $0.2kg$ .The length of the pendulum is equal to $\left(g=10m/s^2\right)$



,

A. $2.0m$

B. $1.8m$

C. $1.5m$

D. $1.2m$

Answer: C

Watch Video Solution

Superposition Of Shm And Compound Pendulum

1. 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 $S.H.M$

B. None-periodic

C. Simple harmonic motion with period $0.1s$

D. Simple harmonic motion with period $0.2s$

Answer: C

Watch Video Solution

2. The displacement of a perticle varies with time as $x = 12\sin\omega t - 16\sin^2\omega t$ (in cm) it is motion is $S.H.M.$ then its maximum acceleration is

A. $12\omega^2$

B. $36\omega^2$

C. $133\omega^2$

D. $\sqrt{192}\omega^2$

Answer: B

Watch Video Solution

3. A particle is acted simultaneously by mutually perpendicular simple harmonic motion

$x = a \cos \omega t$ and $y = a \sin \omega t$. The frequency of motion of the particle will be

A. as ellipse

B. a parabola

C. a circle

D. a straight line

Answer: C

Watch Video Solution

4. The resulting amplitude A' and the vebrations

$$S = A\cos(\omega t) + \frac{A}{2}\cos\left(\omega t + \frac{\pi}{2}\right) \times \frac{A}{4}\cos(\omega t + \pi)$$
$$= \frac{A}{8}\cos\left(\omega t + \frac{3\pi}{2}\right) = A'\cos(\omega t + \delta)$$

are...and...respectively.

A. $\frac{\sqrt{5}}{8}A, \tan^{-1}\left(\frac{1}{2}\right)$

B. $\frac{3\sqrt{5}}{8}A, \tan^{-1}\left(\frac{1}{2}\right)$

C. $\frac{3\sqrt{5}}{8}A, \tan^{-1}\left(\frac{1}{4}\right)$

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

Answer: B

Watch Video Solution

5. A disc of radius R and mass M is plvoted at the rim and is set for small oscillation. if simple pendlum has to have the same period as that the of the disc, the length of the simple pendlum should to

A. $\frac{5}{4} R$

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

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

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

Answer: D

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6. Four types of oscillatory system a simple pendulum a physic pendulum a torsional pendulum and a spring mass system each of same time period are taken to the mass if Time period will have it unchanged?

A. only spring - mass system.

B. spring - mass system and torsional pendulum.

C. spring - mass system and physical pendulum.

D. None of these

Answer: B

Watch Video Solution

7. A particle is subjected to two simple harmonic motion in the same direction having equal amplitudes and equal frequency. If the resultant amplitude is equal to the amplitude of the individual motions. Find the phase difference between the individual motions.

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

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

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

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

Answer: A

Watch Video Solution

8. A particle is executing a motion in which its displacement as a function of time is given by $x = 3\sin(5\pi t + \pi/3) + \cos(5\pi + \pi/3)$ where x is in m and t is in s. Then the motion is

A. simple harmonic with time period $0.2s$

B. simple harmonic with time period $0.4s$

C. simple harmonic with amplitude$3m$

D. not of simple harmonic but a periodic motion

Answer: B

Watch Video Solution

9. Three simple harmonic motion of equal amplitudes A and equal time periods in the same direction combine. The phase of the second motion is 60° ahead of the first and the phase of the third motion is 60° ahead of the second. Find the amplitude of the resultant motion.

A. $3A$

B. $2\sqrt{2}A$

C. $\sqrt{3}A$

D. $2A$

Answer: D

Watch Video Solution

10. Time $S.H.M.$ of equal amplitude a and equal time period in the same direction combine. The first is 60° ahead of the second and second is 60° ahead of the third $S.H.M.$ The amplitude of the resultant oscillation is:

A. a

B. $2a$

C. 0

D. $4a$

Answer: B

Watch Video Solution

11. The displacement of a particle varies according to the relation $y = 4(\cos \pi t + \sin \pi t)$. The amplitude of the particle is

A. g

B. -4

C. 4

D. $4\sqrt{2}$

Answer: D

Watch Video Solution

12. Two partical A and B execute simple harmonic motion according to the equation $y_1 = 3\sin\omega t$ and $y_2 = 4\sin[\omega t + (\pi/2)] + 3\sin\omega t.$ Find the phase difference between them.

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

B. $\tan^{-1}\left(\frac{4}{5}\right)$

C. $\tan^{-1}\left(\frac{3}{4}\right))$

D. None of these

Answer: B

Watch Video Solution

13. The equation of the resulting oscillation obtained by the summation at two mutually perpendicular oscillation with the same frequency $f_1 = f_2 = 5Hz$ and same initial phase $\delta_1 = \delta_2 = 60^\circ$ is (Given their amplitude are $A_1 = 0.1m$ and $A_2 = 0.05m$

A. $0.15\sin\left(10\pi t + \frac{\pi}{6}\right)$

B. $0.05\sin\left(10\pi t + \frac{2\pi}{3}\right)$

C. $0.112\sin\left(10\pi t + \frac{\pi}{3}\right)$

D. $0.313\sin\left(10\pi t + \frac{\pi}{2}\right)$

Answer: C

Watch Video Solution

14. A charged particle as deflected by two mutually perpendicular oscillation electrical field such that the displacement of the particle that in each one at then given by $x = A\sin(\omega t)$ and $y = A\sin\left(\omega t + \frac{\pi}{6}\right)$ respectively. The frequency following by the changed particle is

A. a circle with equation $x^2 + y^2 = A^2$

B. a straight line with equation $y = \sqrt{3}a$

C. an ellipse with equation $x^2 + y^2 - xy = \frac{3}{4}A^2$

D. an ellipse with equation

$$x^2 + y^2 - \sqrt{3}xy = \frac{1}{4}A^2$$

Answer: D

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15. Two SHMs $s_1 = a\sin\omega t$ and $s_2 = b\sin\omega t$ are superimposed on a particle. The s_1 and s_2 are along the direction which makes 37° to each other

A. the particle will perform $S.H.M$

B. the particle will not perform $S.H.M$

C. the particle will perform period motion but not S.H.M

D. the motion will not be oscillatory

Answer: A

Watch Video Solution

16. Time period of a simple pendulum of length L is T_1 and time period of a uniform rod of the same length L pivoted about one end and oscillating in vertical plane is T_2. Amplitude of oscillation in both the cased is small. The T_1/T_2 is:

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

B. $1/\sqrt{3}$

C. $\sqrt{3}/\sqrt{2}$

D. $1/\sqrt{2}$

Answer: C

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17. A $25kg$ uniform solid sphere with a $20cm$ radius is suspended by a vertical wire such that the point of suspension is vertically above the center of the sphere. A torque of 0.10N-m is required to rotate the sphere through an angle of 1.0 rad and then maintain the orientation. If sphere is then released, its time period of the oscillation will be

A. πsecond

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

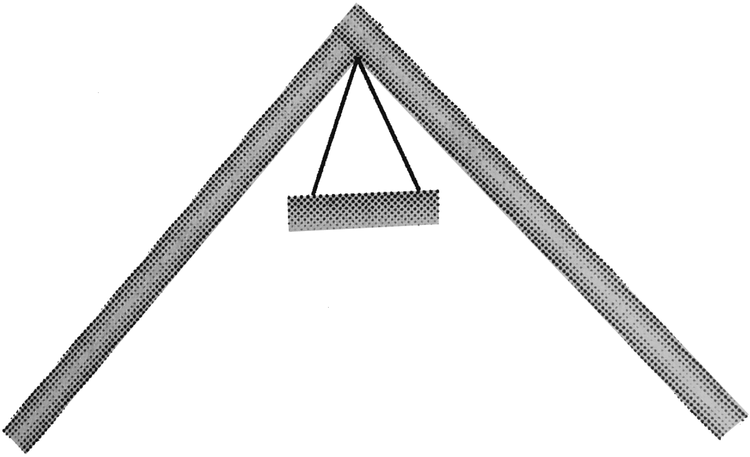
C. 2πsecond

D. 4πsecond

Answer: D

Watch Video Solution

18. Two identacal rods each of length l and mass m weided toeather at right angle and edge suspended from a kinetic sides as shown Angular frequency of small oscillation of the system in its then plane about the total of suspension is



A. $\sqrt{\frac{3g}{4\sqrt{2}l}}$

B. $\sqrt{\frac{3g}{2\sqrt{2}l}}$

C. $\sqrt{\frac{3g}{\sqrt{2}l}}$

D. None of these

Answer: B

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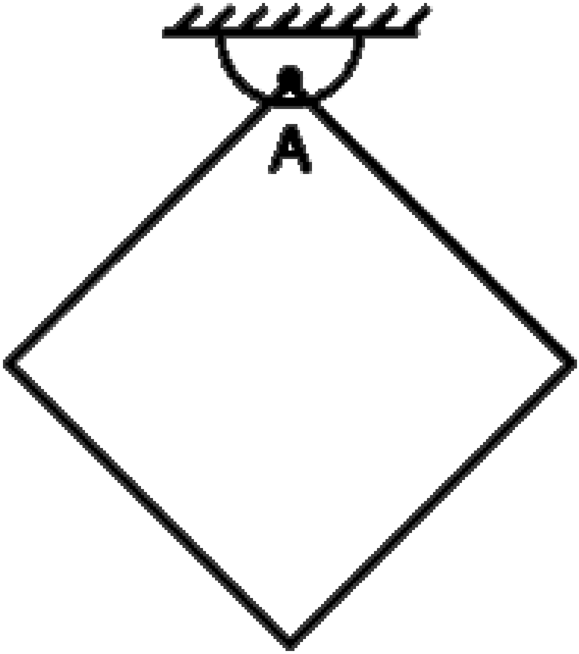
19. A square plate of mass M and side length L is hinged at one of its vertex (A) and is free to rotate about it. Find the time period of small oscillations if

(a) the plate performs oscillations in the vertical plane of the figure. (Axis is perpendicular to figure.)

(b) the plate performs oscillations about a horizontal axis passing through A lying in the plane of the figure.



A. $2\pi\sqrt{\dfrac{2a}{3g}}$

B. $2\pi\sqrt{\dfrac{\sqrt{2}a}{3g}}$

C. $2\pi\sqrt{\dfrac{2\sqrt{2}a}{3g}}$

D. $2\pi\sqrt{\dfrac{2\sqrt{2a}}{g}}$

Answer: C

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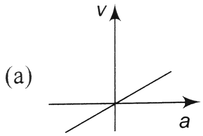
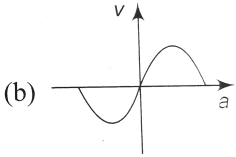
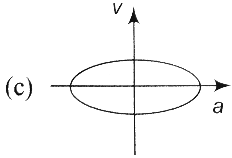
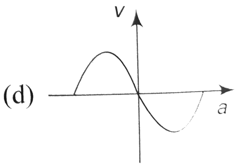
Problems Based On Mixed Concepts

1. A particle is performing a linear simple harmonic motion if the acceleration and the corresponding velocity of the particle are a and v respectively. Which of the following graph is correct?

A. 

B. 

C. 

D. 

Answer: C

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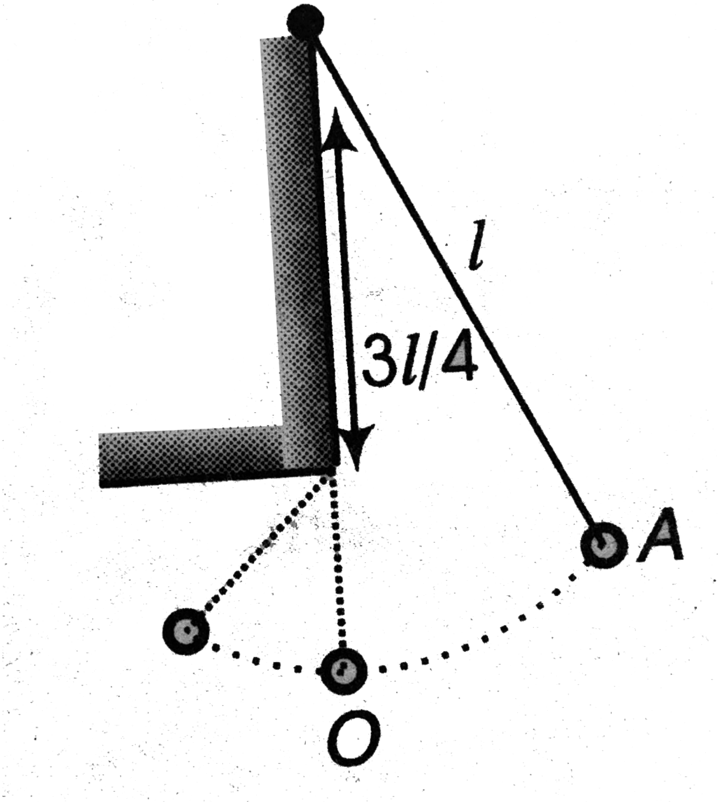
2. A pendulum has a period T for small oscillations. An obstacle is placed directly beneath the pivot, so that only the lowest one - quarter of the string can follow the pendulum bob when it swings to the left of its resting position. The pendulum is released from rest at a certain point. How long will it take to return to that point again ? In answering this question, you may assume that the angle between the moving string and the vertical stays small throughout the motion.



A. T

B. $T/2$

C. $3T/4$

D. $T/4$

Answer: C

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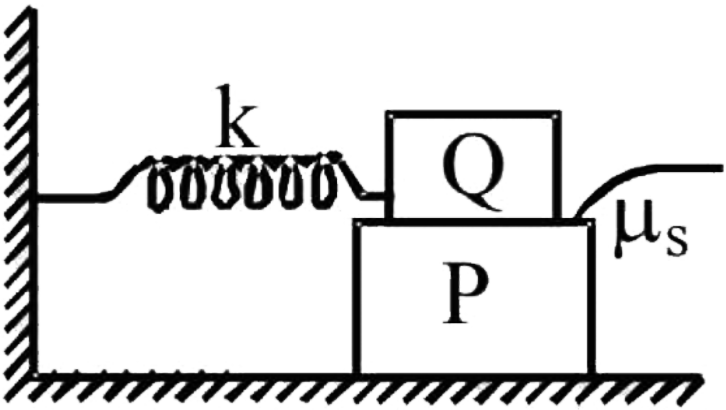
3. A block P of mass m is placed on horizontal frictionless plane. A second block of same mass m is placed on it and is connected to a spring of spring constant k, the two blocks are pulled by distance A. Block Q oscillates without slipping. What is the maximum value of frictional force between the two blocks.



A. kA

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

C. zero

D. $\mu_s mg$

Answer: B

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4. A particle is moving along the axis under the influnence of a force given by $F = -5x + 15$. At time $t = 0$, the particle is located at $x = 6$ and having zero velocity it take 0.5 second to reach the origin for the first time. The equation of mnotion of the particle can be respected by

A. $x = 3 + 3\cos \pi t$

B. $x = 3\cos \pi t$

C. $x = 3 + 3\sin \pi t$

D. $x = 3 + 3\cos(2\pi t)$

Answer: D

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5. In the above question the mass of the particle is

A. $3\pi^2$

B. $\frac{5\pi^2}{4}$

C. $\frac{5}{4\pi^2}$

D. $\frac{1}{3\pi^2}$

Answer: C

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6. A particle executes simple harmonic motion according to the displacement equation $y = 10\cos\left(2\pi t + \frac{\pi}{6}\right)cm$ where t is in second The velocity of the particle at $t = \frac{1}{6}$ second will be

A. $-6.28ms^{-1}$

B. $-0.628 m s^{-1}$

C. $0.628 m s^{-1}$

D. $6.28 m s^{-1}$

Answer: C

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7. Find the distance covered by a particle from time $t = 0$ to $t = 6$ sec when the particle follow the movament according to $y = a \cos\left(\frac{\pi}{4}\right)t$

A. a

B. $2a$

C. $3a$

D. $4a$

Answer: C

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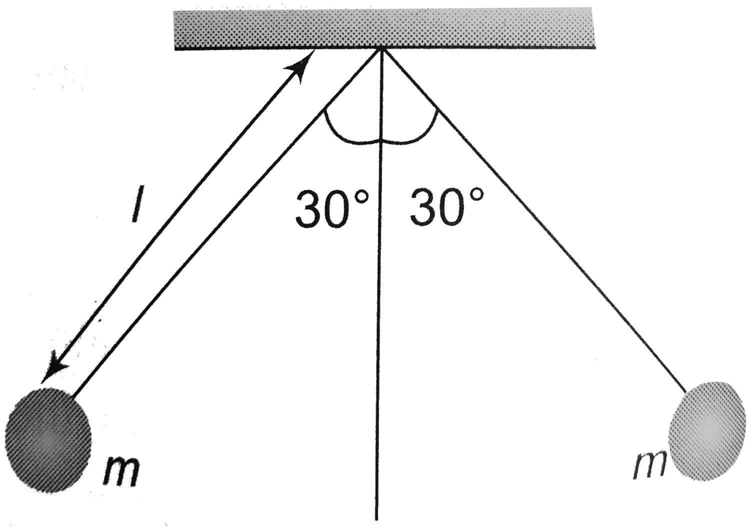
8. Two very small having mass m are atteched to two masses rods of length l Now these rods are joined it form V like figure having angle 60° This assumility is new higest in a verticle plane so that it can rotan without any friction about a horizontal axis perpendicular in the plane of figure) as shown in the figure The period of small oscilation of this asseamble is



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

B. $2\pi\sqrt{\frac{2l}{\sqrt{3}g}}$

C. $2\pi\sqrt{\frac{1}{\sqrt{3}g}}$

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

Answer: B

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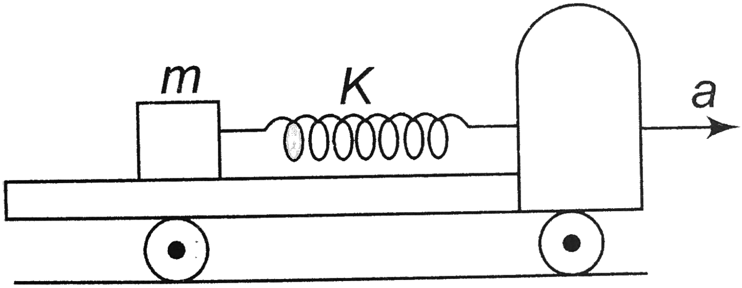
9. One end of an spring is connected with a smooth block with the other end with rear wall of a truck as shown in figure. initially, the system is at rest if track start to its accelerate with a constant acceleration then the block (relative to track)



A. will remain stationary.

B. will start oscillation with constant amplitude.

C. will start stationary with increasing amplitude.

D. moves such that length of the spring first increases and then becomes constant.

Answer: B

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10. A particle free to move along the (x - axis) hsd potential energy given by $U(x) = k[1 - \exp(-x^2)]f$ or $-oo \le x \le +oo$, where (k) is a positive constant of appropriate dimensions. Then.

A. for small total displacement from $x = 0$, the motion is simple harmonic

B. if its total machanical energy is $k/2$, it has its maximum kinetic energy at the origin.

C. for any final norezero value of s there is a force directed away from the origin.

D. at points away from the origin the particle is in unstable equilibrium.

Answer: A

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11. A particle moves along a straight line to follow the equation $ax^2 + bv^2 = k$, where a, b is and k are constant and x and and x axis coordirete and velocity of the particle respectively find the amplitude

A. $\sqrt{\frac{k}{b}}$

B. $\sqrt{\frac{b}{k}}$

C. $\sqrt{\frac{a}{k}}$

D. $\sqrt{\frac{g}{a}}$

Answer: D

Watch Video Solution

12. Two particle of same time period (T) and amplitude undergo SHM along the same line with initial and phase of $\pi/6$. If they start at the same point along the opposite directions. Find the time other which they will meet again for the first time

A. $T/8$

B. $T/4$

C. $T/2$

D. T

Answer: C

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13. As time $t = 0$ one particle is at maximum position amplitude and the other is at half at the position amplitude Their amplitude and time period T are same if they are appoatules find the take by which they cross each other

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

B. $\frac{T}{12}$

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

D. $\frac{T}{24}$

Answer: B

Watch Video Solution

14. The displacement function of a $S.H.M$ is given by

$y = \cos[(\omega t + \phi)]$

if at $t = 0$ th displaxcement is $y = 1$ on and velocity cms^{-1} The value amplitude $(A \in cm)$ is

A. 1

B. 1

C. $\sqrt{2}$

D. $1/\sqrt{2}$

Answer: C

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15. A particle oscillation is given by $(f_0) = kpl^2$ with for constant k and an amplitude A The maximum velocity during the oscillation a preperitiaonal to :

A. A

B. A^2

C. $A^{3/2}$

D. none of these

Answer: C

Watch Video Solution

16. A mass of $0.98kg$ attached on a spring of constant $K = 100Nm^1$ is hit by a bules of $20gm$ moving with a velocity $20ms^1$ horizontally The bullet gas ambated and system oscilation with the mass on horizontal and surface The amplitude of oscilation will be

A. $0.6cm$

B. $6cm$

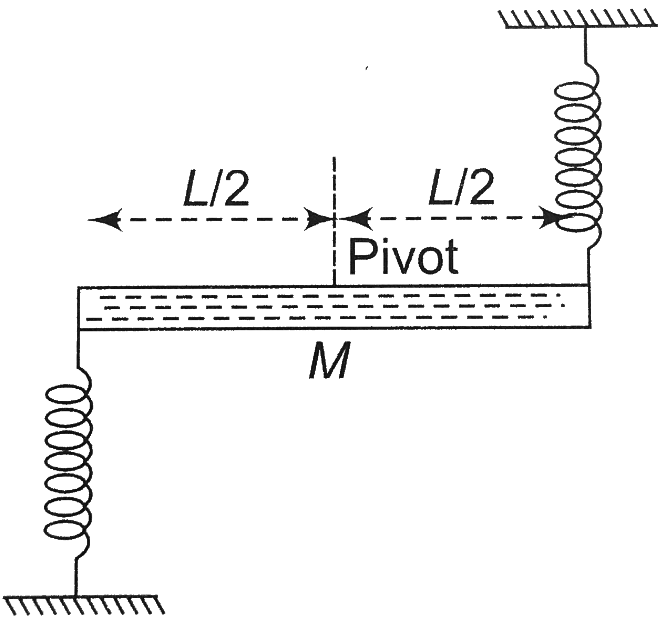
C. $1.2cm$

D. $12cm$

Answer: B

Watch Video Solution

17. A uniform stick of mass M and length L is pivoted its come its ands are fast to two spring each of the constant K. In the position shown in figure the same through a small length when spring is display through a small angle of and released. The stick :



A. executes non- periodic motion

B. executes periodic motion which in its not simple harmonic

C. executes $S.\ H.\ M.$ of frequency $\frac{1}{2\pi}\sqrt{\frac{6K}{M}}$

D. executes $S.\ H.\ M.$ of frequency $\frac{1}{2\pi}\sqrt{\frac{K}{2M}}$

Answer: C

Watch Video Solution

18. The potential energy of a particle of mass $1kg$ in motion along the x- axis is given by:

$U = 4(1 - \cos 2x)$, where x in metres. The period of small oscillation (in sec) is

A. 2π

B. π

C. $\pi/2$

D. $\pi/4$

Answer: C

Watch Video Solution

19. A particle executing SHM while moving from executy it found at distance $x_1 x_2$ and x_2 from comes at the and of three successive second The period of oscilation is

where $\theta = \cos^{-1}\left(\frac{x_1 + x_2}{2x_2}\right)$

A. $2\pi / \theta$

B. π / θ

C. θ

D. $\pi / 2\theta$

Answer: A

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20. A particle of mass m is executing oscillations about origin on the x axis amplitude A its potential energy is given as$U(x) = \beta x^4$ where β is constant x cooridirate of the particle where the potential energy is one third of the kinetic energy is

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

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

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

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

Answer: B

Watch Video Solution

21. A body is executing a simple harmonic motion such that its potential energy is U_1at $U_2 a t y$ When the displacement is $x+y$ the potential energy will be

A. $U_1 + U_2$

B. $\sqrt{U_1^2 + U_2^2}$

C. $U_1 + U_2 + 2\sqrt{U_1 U_2}$

D. $\sqrt{U_1 U_2}$

Answer: C

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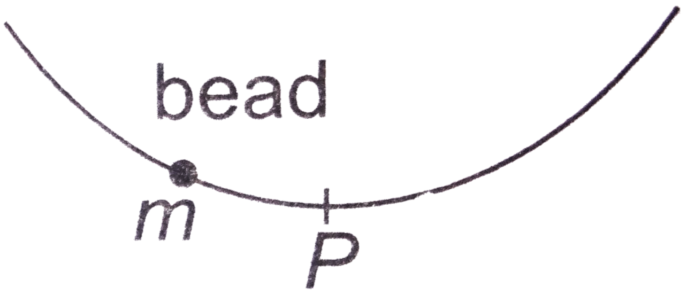
22. A bead of mass m can slide on a frictionless wire as shown in figure Because of the given shape of the wire near p the bottom point , it can be approximated as near p the potential energy of the bead is given $U = cx^2$ where c is a constant and x is measured from p The bead if displacement slightly from point p will oscillate about p The period of oscillation is



A. $2\pi\sqrt{c/m}$

B. $2\pi\sqrt{m/2c}$

C. $2\pi\sqrt{m/c}$

D. $2\pi\sqrt{2c/m}$

Answer: B

Watch Video Solution

23. A horizontal spring -block system of mass $2kg$ executes $S.H.M$ when the block is passing through its equilibrium positiojn an object of mass $1kg$ is put on it the two move togather The new amplitude of vibration is (A being its initial amplitude)

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

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

C. $\sqrt{2}A$

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

Answer: A

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24. An air chamber of volume V has a long of cross sectional area A. A ball of mass m is fixed sympthlly in the track The ball modulus of air is B ball is pressed down slightly and released, the time period of the oscillation is

A. $2\pi\sqrt{\frac{mV}{2BA^2}}$

B. $\pi\sqrt{\frac{2mV}{BA^2}}$

C. $2\pi\sqrt{\frac{mV}{BA^2}}$

D. $\frac{\pi}{2}\sqrt{\frac{m}{BA^2}}$

Answer: C

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Assertion Reasoning

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

Reason : Displacementand velocity of SHMdiffer in phase by $\frac{\pi}{2}$

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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2. Assertion : The time period of a simple pendulum of infinite length is infinite

Reason:The time period is a simple pendulum is directly propotional to the square root of length

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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3. Assertion : The time period of a pendulum on a satellite orbiting the earth in infinite

Reason:The period of a pendulum is inversely propotional to square root of acceleration due to gravity

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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4. Assertion :Simple harmonic motion is not a uniform motion.

Reason : It is the projection of uniform circular motion.

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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5. Assertion : A hole were drilled through the center of each and a ball is dropped into the hole at one will not get other out of other end of the hole

Reason : It will come out of the end normally

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: C

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6. Assertion: The bob of a simple pendulum is a full of water if a fine hole is made at the bottom of the of the ball , then the time period will no more remain constant

Reason : The time period of simple pendulum does not depend open mass

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of

assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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7. Assertion : The length of a simple pendulum is increases by 4% the corresponding decrease in time period will be 2%

Reason : $T = \propto \sqrt{1}$

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: D

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8. Assertion : The gerph between velocity and displacement for a harmonic oscillation is a parabola

Reason : Velocity does not change uniformly with displacement in simple harmonic motion

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: C

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9. Assertion: The simple harmonic motion is to and the fro and periodic

Reason : The motion of the earth is periodic

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

assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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10. Assertion : The periodic time of hard spring is less its compared to that of soft string

Reason: The periodic time depend upon the spring constant

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

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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11. Assertion : If the earth suddenly comtracts , the duration of day will decreases

Reason : The angular velocity of the earth's rotation will decrease

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: C

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12. Assertion : Damped vibrations indicate loss of energy

Reason : The loss may be due to friction , air resistance etc

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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13. Assertion : When a simple pendulum is made to oscillate on the surface of moon , its time period increase

Reason: Moon is much smaller compared to earth

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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14. Assertion : In SHM acceleration is always direction toward the mean position

Reason : The body stope momentally at the extrame position and then moves back to mean position

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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15. Assertion : The graph of PE and KE of a particle is SHM with respect to position is a parabola

Reason : This because PE and KE not vary linear will position

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

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16. Assertion: In a simpleharmonic motion the kinetic and potential energy becomes equal when the displacement is $\frac{1}{\sqrt{2}}$ time the amplitude

Reason: is SHM kinetic energy is zero when potential energy is maximum

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: B

Watch Video Solution

17. Assertion : The soldiers marching on a suspended brids are advised to go of stape

Reason : frequency of marching step may match we the nature frequency of oscillation of bridge

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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18. Assertion : For a simple pendlume the graph between ans T^2 is hyperbola

Reason : $T = 2\pi\sqrt{\frac{g}{1}}$

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: C

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19. Assertion : A man with a wristwatch spring wound his hand falls the top of a tower The watch show this correct time

Reason : The acceleration due to gravity have no effect on time period of watch of the time of filling

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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20. Assertion : Sine and cosine function are perioic function

Reason: sinusoidal function repear its value after a definite interval of time

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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21. Assertion : A small body of mass $0.1kg$ is undergoing SHM of amplitude $1.0m$ and period $0.2s$ The maximum value of the force acting on a its $98.7N$

Reason : Maximum force acting on it is given by the $F = m\omega^2 r$

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

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: A

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22. Assertion : Two unequal of same instrial are loaded with same load The longer one will have longer value of time period

Reason: The concept will follow if we made a expect to measure

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If assertion is true but the reason is false

D. If both assertion and reason are false

Answer: C

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NEET Questions

1. There is a body having mass m and performinf SHM amplitude a There is a restroring force $F = -Ks$ where x is the displacement The total energy of body depends upon

A. K,x

B. K,a

C. K,a,x

D. K,a,v

Answer: B

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2. A hollow sphere filled with water through a small body in it is then hung by a long thread and made to oscillation As the water slowly force end of the hole at the bottom the period of oscillation will

A. continuosly decrease

B. continuosly increase

C. first decreases and then increases to original value

D. first increases and then decrease to original value

Answer: D

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3. The kinetic energy and the potential energy of a particle executing SHM are equal The ratio of its displacement and amplitude will be

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

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

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

D. $\sqrt{2}$

Answer: A

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4. Displacement between maximum potential energy position energy positionand maximum ki9netic energy position for a particle executing $S.H.M$ is

A. $-a$

B. $+a$

C. $\pm a$

D. $+\frac{a}{4}$

Answer: C

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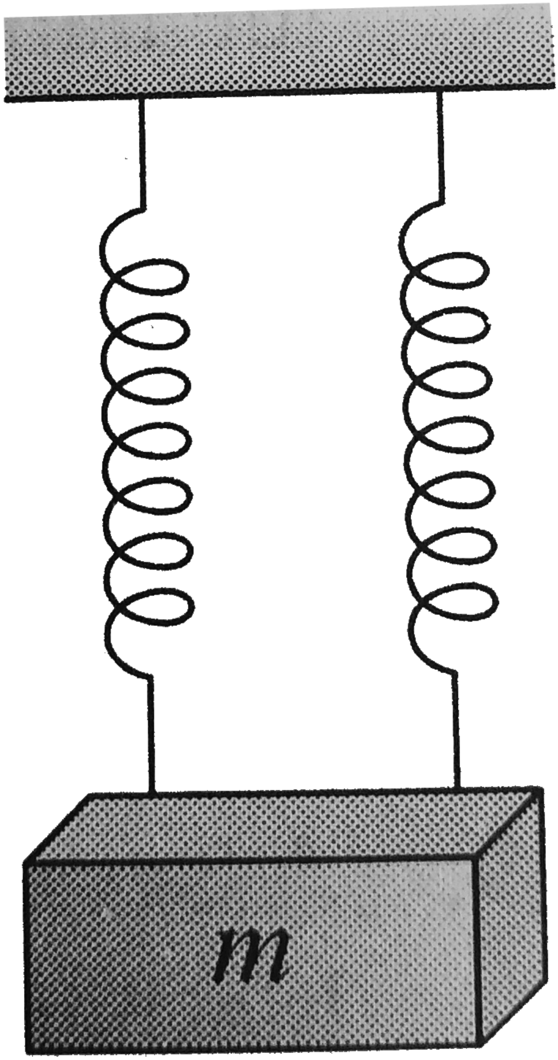
5. A mass m is suspended separately by two different springs of spring constant k_1 and k_2 given the time period t_1 and t_2 respectively. If the same mass m is shown in the figure then time period t is given by the relation



A. $t = t_1 + t_2$

B. $t = \frac{t_1 t_2}{t_1 + t_2}$

C. $t^2 = t_1^2 + t_2^2$

D. $t^{-2} = t_1^{-2} + t_2^{-2}$

Answer: D

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6. A particle doing simple harmoonic motion amplitude $= 4cm$ time peiod $= 12 \sec$ The ratio between time taken by it in going from its mean position to $2cm$ and from $2cm$ to exterme position is

A. 1

B. $1/3$

C. $1/4$

D. $1/2$

Answer: B

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7. The potential energy of a harmonic oscillation when is half way to its and end point is (where E it's the total energy)

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

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

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

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

Answer: B

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8. The time period of a mass suspended from a spring is T if the spring is cut in to equal part and the same mass is suspended from one of the

pert then the time period will be

A. T

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

C. $2T$

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

Answer: B

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9. In case of a force vibration the resonance wave becomes very step when the

A. resting force is small

B. amplitude periodic force is small

C. quantity factor is small

D. damping force is small

Answer: D

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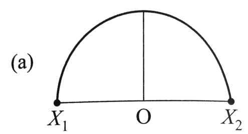
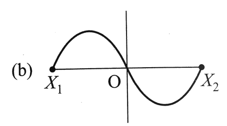
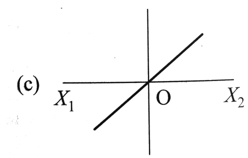
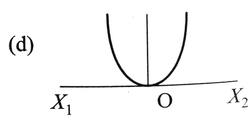
10. A particle of mass m oscillates with simple harmonic motion between points x_1 and x_2 the equilibrium position being O its potential energy in plotted it will be as given bellow in the graph

A. 

B. 

C. 

D. 

Answer: D

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11. Which one of the following statement is true for the speed v and the acceleration a of a particle executing simple harmonic motion?

A. When v is maximum a is maximum

B. When v is minimum a is also minimum

C. When v is zero a is zero

D. When v is maximum a is zero

Answer: D

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12. Two spring of spring constant k_1 and k_2 are joined in series The effective spring constant of the combination is given by

A. $\sqrt{k_1 k_2}$

B. $(k_1 + k_2)/2$

C. $k_1 + k_2$

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

Answer: D

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13. The resultant of two rectangular simple harmonic motion of the same frequency and unequal amplitude but differing in phase by $\pi/2$ is

A. Simple harmonic

B. Circular

C. Elliptical

D. Parabolic

Answer: C

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14. A particle executing simple harmonic motion of amplirtude $5cm$ has maximum speed of $31.4cm/s$ The frequency of its oscillation is

A. $3Hz$

B. $2Hz$

C. $4Hz$

D. $1Hz$

Answer: D

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15. The potential energy of a spring when stretched by $2cm$ is U. if the spring is stretched by $8cm$ the potential energy in it is

A. $4U$

B. $8U$

C. $16U$

D. $U/4$

Answer: C

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16. A rectangular block of mass m and area of cross a small vertical displacement from equilibrium it undergoes oscillation with a time period T then

A. $T \propto \sqrt{p}$

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

C. $T \propto \frac{1}{p}$

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

Answer: B

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17. The pahse difference between the instantaneous veliocity and acceleration of a particle executing simple harmonic motion is

A. 0.5π

B. π

C. 0.707π

D. zero

Answer: B

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18. The particle executing simple harmonic motion has a kinetic energy $K_0 \cos^2 \omega t$. The maximum values of the potential energy and the energy are respectively

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

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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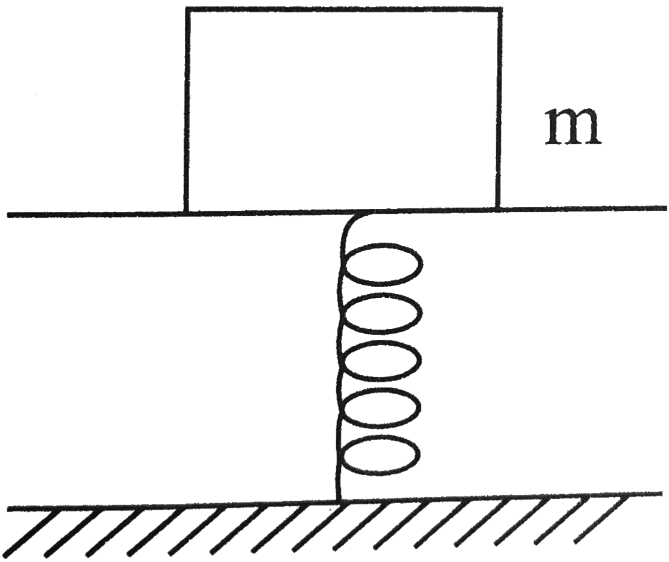
19. A mass of $2.0kg$is put on a that pan attached to a vertical spring fixed on the ground as shown in the figure The mass of the spring and the pen is negligible the mass executing a simple harmonic motion The spring constant is

$200N/m$ what should be the minimum amplitude of the motion so that the mass get detached from the part? $(Tak \in gg = 10m/s^2)$



A. $0.8cm$

B. $10.0cm$

C. Any value less than $12.0cm$

D. $4.0cm$

Answer: B

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20. A particle executes simple harmonic oscillation with an amplitude a. The period of oscillations is T. The minimum time taken by the particle to travel half to the amplitude from the equiliibrium position is

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

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

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

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

Answer: C

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

A. $1:10$

B. $1:10^2$

C. $1:10^3$

D. $1:10^4$

Answer: B

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22. A point simple harmonic oscillation of the period and the equation of motion is given by $xa\sin(\omega t + \pi/6)$ after the step of friction of the time period the velocity of the part will be equal

to half of its maximum velocity?

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

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

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

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

Answer: D

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23. A simple pendulum performs simple harmonic motion about $x = 0$ with an amplitude a and time period T speed of the pendulum at $x = a/2$ will be

A. $\frac{\pi a\sqrt{3}}{2T}$

B. $\frac{\pi a}{T}$

C. $\frac{3\pi^2 a}{T}$

D. $\frac{\pi a\sqrt{3}}{T}$

Answer: D

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24. Which one of the following equation at the repressents simple harmonic motion ?

A. Acceleration $= - k_0 x + k_1 x^2$

B. Acceleration $= - k(x + a)$

C. Acceleration $= k(x + a)$

D. Acceleration $= kx$

Answer: B

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25. A block of mass m attached in the lower and vertical spring The spring is hung from a calling and force constant value k The mass is released from rfest with the spring velocity unstrached The maximum value praduced in the length of the spring will be

A. Mg/k

B. $2Mg/k$

C. $4Mg/k$

D. $Mg/2k$

Answer: B

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

A. simple harmonic motion of frequency $\omega t \pi$

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

C. simple harmonic motion

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

Answer: C

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27. The period of oscillation of a mass M suspended a spring negligible mass is T if along with it and there mass M is also suspended the period of oscillation now be

A. `T

B. $T/\sqrt{2}$

C. $2T$

D. $\sqrt{2}T$

Answer: D

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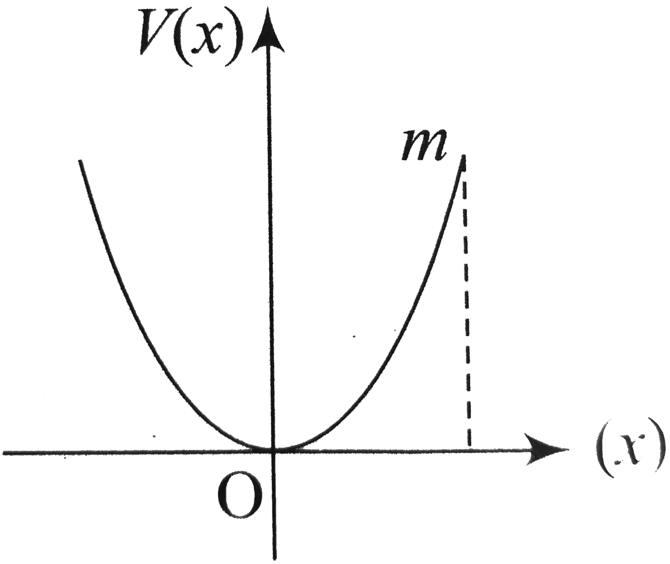
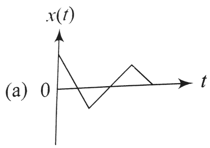
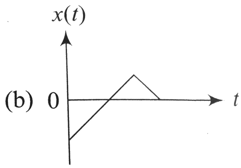
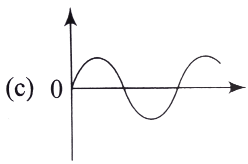
28. A particle of mass m is released from rest and follow a particle part as shown Assuming that the displacement of the mass from the origin is small which graph correctly depicts the position of the

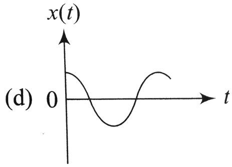
particle as a function of time?



A. 

B. 

C. 

D. 

Answer: D

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

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

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

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

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

A. only(iv) does not represent SHM

B. (i) and (iii)

C. (i) and (ii)

D. only (i)

Answer: B

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

A. zero

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

C. π

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

Answer: B

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

A. kgs

B. $kgms^{-1}$

C. $kgms^{-2}$

D. kgs^{-1}

Answer: A

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

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

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

A. 2π

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

C. 3π

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

Answer: B

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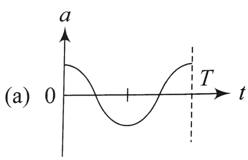
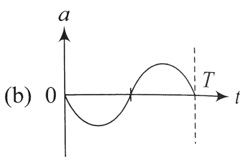
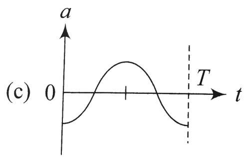
33. The oscillation of a body on a smooth horizontal surface is represented by the equation

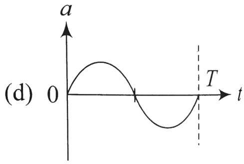
$X = A\cos(\omega t)$

which one of the following graph shown correctly the variation a with t?

A. 

B. 

C. 

D. 

Answer: C

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

A. Not a simple harmonic

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

C. simple harmonic with amplitude $\sqrt{(a)^2 + (b)^2}$

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

Answer: C

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35. (a) The motion of the particle in simple harmonic motion is given by $x = a \sin \omega t$. If its speed is u, when the displacement is x_1 and speed is v, when the displacement is x_2, show that the amplitude of the motion is

$$A = \left[\frac{v^2 x_1^2 - u^2 x_2^2}{v^2 - u^2}\right]^{1/2}$$

(b) A particle is moving with simple harmonic motion is a straight line. When the distance of the particle from the equilibrium position has the values x_1 and x_2 the corresponding values of velocity are u_1 and u_2, show that the period is

$$T = 2\pi\left[\frac{x_2^2 - x_1^2}{u_1^2 - u_2^2}\right]^{1/2}$$

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

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

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

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

Answer: B

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36. A particle is executing a simple harmonic motion its maximum acceleration is a and maximum velocity is β .Then its time of vibration will be

A. $\dfrac{2\pi\beta}{\alpha}$

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

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

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

Answer: A

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37. A body of mass m is atteched to the lower end of a spring whose upper end is fixed .The spring has negaligible mass .When the mass m is slightly puylled down and released it oscillation with a time period of $3s$ when the mass m is increased by $1kg$ time period of oscillations becomes $5s$ The value of m in kg is

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

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

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

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

Answer: B

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

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

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

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

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

Answer: B

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

A. $1s$

B. $2\pi s$

C. $2s$

D. πs

Answer: D

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AIIMS Questions

1. 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 length is.

A. 10%

B. 21%

C. 30%

D. 50%

Answer: A

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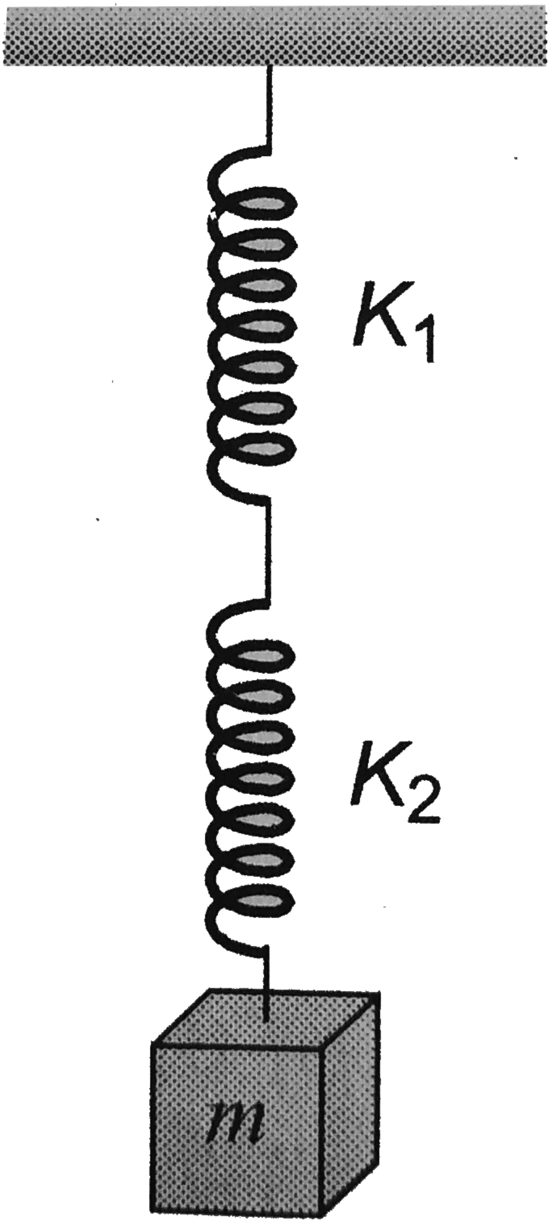
2. The frequency of oscillation of the spring shown in the figure will be



A. $\frac{1}{2\pi}\sqrt{\frac{K}{m}}$

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

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

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

Answer: D

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3. A partcle is performing simple harmonic motion along x- axis with amplitude $4cm$ and time period $1.2\sec$ The minimum time period taken by the again is given by

A. 0.6 sec

B. 0.4 sec

C. 0.3 sec

D. 0.2 sec

Answer: B

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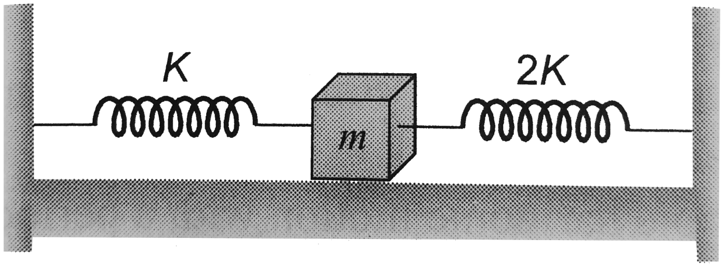
4. Two spring of force constants K and $2K$ are connected a mass m below The frequency of oscillation the mass is



A. $\left(\frac{1}{2\pi}\right)\sqrt{\left(\frac{K}{m}\right)}$

B. $\left(\frac{1}{2\pi}\right)\sqrt{\left(\frac{2K}{m}\right)}$

C. $\left(\frac{1}{2\pi}\right)\sqrt{\left(\frac{3K}{m}\right)}$

D. $\left(\frac{1}{2\pi}\right)\sqrt{\left(\frac{m}{K}\right)}$

Answer: C

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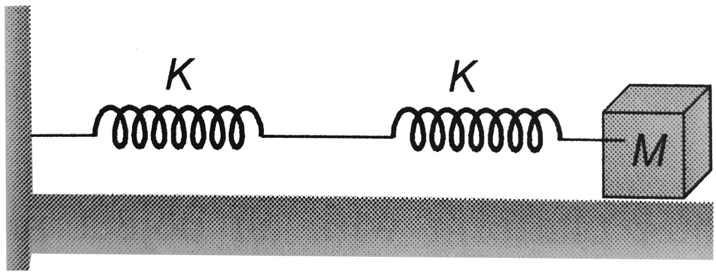
5. Two spring are connected toa block of mass M placed a frictionless surface as shown if both the spring have a spring constant k the frequency of oscillation block is



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

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

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

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

Answer: A

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6. Which of the following functionss represents a simple harmonic oscillation ?

A. $\sin \omega t - \cos \omega t$

B. $\sin^2 \omega t$

C. $\sin \omega t + \sin 2\omega t$

D. $\sin \omega t - \sin 2\omega t$

Answer: A

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

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

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

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

Answer: D

Watch Video Solution

8. A simple pendulum hangs the celling of a car if the car acceleration with a uniform acceleration , the frequency of the simple pendulum will

A. increase

B. decrease

C. become infinite

D. remain constrant

Answer: A

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9. 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 plateform

B. for an amplitude of g^2 / ω^2

C. for an amplitude of g / ω^2

D. at the highest position of the plateform

Answer: C

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

A. a periodic,but a simple harmonic motion with a pariod $2\pi / \omega$

B. a simple harmonic motion with a pariod

$2\pi/\omega$

C. a simple harmonic motion with a pariod

π/ω

D. a periodic,but a simple harmonic motion

with a pariod π/ω

Answer: D

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

A. independent of a

B. proportional to $\sqrt{a}$

C. proportional to $a^{3/2}$

D. proportional to $\frac{1}{\sqrt{a}}$

Answer: D

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12. A harmonic plateform with an object placed on it is executing SHM in the verticle direction The amplitude of oscillation is $3.29 + 10^{-3} m$ what must be the least period of these oscillation so that the object is not detached from the plateform

A. 0.1256 sec

B. 0.1356 sec

C. 0.1456 sec

D. 0.1556 sec

Answer: A

Watch Video Solution

13. A simple pendulum has time period T The bob is given negative charge and surface below it is given position change new time period will be

A. less then T

B. greater then T

C. equal to T

D. infinite

Answer: A

Watch Video Solution

14. A mass M is suspended from a spring of negiliglible mass the spring is pulled a little and then released so that the mass executes simple harmonic oscillation with a time period T If the mass is increases by m the time period because $\left(\frac{5}{4}T\right)$,The ratio of $\frac{m}{M}$ is

A. $9/16$

B. $25/16$

C. $4/5$

D. $5/4$

Answer: A

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15. The amplitude of a executing SHM is $4cm$ At the mean position the speed of the particle is $16cm/s$ The distance of the particle from the mean position at which the speed the particle becomes $8\sqrt{3}cm/s$ will be

A. $2\sqrt{3}cm$

B. $\sqrt{3}cm$

C. $1cm$

D. $2cm$

Answer: D

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16. A particle is performing harmonic motion if its velocity are v_1 and v_2 at the displecement from the mean position are y_1 and y_2 respectively then its time period is

A. $2\pi\sqrt{\dfrac{y_1^2 + y_2^2}{v_1^2 + v_2^2}}$

B. $2\pi\sqrt{\dfrac{v_2^2 - v_2^2}{y_1^2 - y_2^2}}$

C. $2\pi\sqrt{\dfrac{y_1^2 - y_2^2}{v_2^2 + v_1^2}}$

D. $2\pi\sqrt{\dfrac{v_1^2 + v_2^2}{y_1^2 + y_2^2}}$

Answer: C

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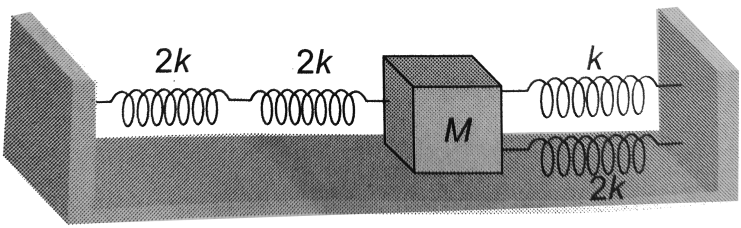
17. Four mass less spring whose force constant are $2k$, $2k$, k and $2k$ respectively are attached to a mass M kept on a friction less plate (as shown in figure) if the mass M is displaced in the horizontal direction then the frequency of oscillation of the system is



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

B. $\dfrac{1}{2\pi}\sqrt{\dfrac{k}{7M}}$

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

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

Answer: C

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18. Assertion : The amplitude of an oscillation pendulum decreases gradually with time

Reason : The frequency of the pendulum decrease with time

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: C

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19. Assertion : The periodic time of hard spring is less its compared to that of soft spring

Reason: The periodic time depend upon the spring constant

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: A

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20. Assertion : Resonance is special case of force vibration in which the nature frequency of vebration of the body is the same as the impressed frequency of external periodic force and the amplitude of force vibration is maximum

Reason: The amplitude of forced vibrations of a bodyincrease with an increase in the frequency of the externally impressed perioic force

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: C

Watch Video Solution

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

Reason : Displacement and velocity of SHM differ in phase by $\frac{\pi}{2}$

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: B

Watch Video Solution

22. Assertion : The graph of total energy of a particle in SHM w.r.t. position is a line with zero slope

Reason : Total energy of particle in SHM remain constant throughout its motion

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: A

Watch Video Solution

23. Assertion :Simple harmonic motion is not a uniform motion

Reason : It is the projection of uniform circle motion

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: B

Watch Video Solution

24. Assertion : The periodic time of hard spring is less its compared to that of soft spring

Reason: The periodic time depend upon the spring constant

A. If both assertion and reason are true and the reasopn is a true explanation of the assertion

B. If both assertion and reason are true and but the reason is not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: A

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Chapter Test

1. A chimpainzee swinging on a sitting position stands up suddenly the time period

A. Become infinite

B. Remain same

C. increase

D. Decrease

Answer: D

Watch Video Solution

2. A plane oscillation oscillation with time period T suddenly another aplte put on the first plate, then time operiod

A. will decrease

B. will increase

C. will be same

D. None of these

Answer: C

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3. If a spring has time period T, and is cut into (n) equal parts, then the time period of each part will be.

A. $T\sqrt{n}$

B. $T/\sqrt{n}$

C. n/T

D. T

Answer: B

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4. 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 statements is true?

A. PE is maximum when $x = 0$

B. KE is maximum when $x = 0$

C. TE is zero when $x = 0$

D. KE is maximum when x is maximum

Answer: B

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5. 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. 10%

B. 21%

C. 30%

D. 50%

Answer: A

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6. Two bodies (M) and (N) of equal masses are suspended from two separate massless springs of spring constants (k_1) and (k_2) respectively. If the two bodies oscillate vertically such that their maximum velocities are equal, the ratio of the amplitude of vibration of (M) to the of (N) is.

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

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

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

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

Answer: D

Watch Video Solution

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

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

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

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

Answer: D

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8. The displacement of a particle varies according to the relation $y = 4(\cos \pi t + \sin \pi t)$. The amplitude of the particle is

A. 8

B. -4

C. 4

D. $4\sqrt{2}$

Answer: D

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9. The total energy of a particle, executing simple harmonic motion is.

where x is the displacement from the mean position, hence total energy is independent of x.

A. $\propto x$

B. $\propto x^2$

C. independent of x

D. $\propto x^{1/2}$

Answer: C

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10. A particle at the end of a spring executes S.H,M with a period t_2 If the period of oscillation with two spring in .

A. $T = t_1 + t_2$

B. $T^2 = t_1^2 + t_2^2$

C. $T^{-1} = t_1^{-1} + t_2^{-1}$

D. $T^{-2} = t_1^{-2} + t_2^{-2}$

Answer: B

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11. 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. $t = 2t_0$

D. $t = 4t_0$

Answer: C

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12. A particle of mass (m) is attached to a spring (of spring constant k) and has a narural angular frequency omega_(0). An external force $R(t)$

proportional to cos omegat(omega!=omega)(0) is applied to the oscillator. The time displacement of the oscillator will be proprtional to.

A. $\dfrac{m}{\omega_0^2 - \omega^2}$

B. $\dfrac{1}{m\left(\omega_0^2 - \omega^2\right)}$

C. $\dfrac{1}{m\left(\omega_1^2 + \omega^2\right)}$

D. $\dfrac{m}{\omega_1^2 + \omega^2}$

Answer: B

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13. Two simple harmonic are represented by the equation

$$y_1 = 0.1 \sin\left(100\pi + \frac{\pi}{3}\right) \text{ and } y_2 = 0.1 \cos \pi t.$$

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: C

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14. If a simple harmonic motion is represented by

$$\frac{d^2x}{dt^2} + ax = 0,$$

its time period is.

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

B. $2\pi a$

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

D. $2\pi\sqrt{a}$

Answer: C

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

A. a simple harmonic motion with a pariod $2\pi/\omega$

B. a simple harmonic motion with a pariod π/ω

C. a periodic but not simple harmonic motion with a pariod $2\pi/\omega$

D. a periodic but not simple harmonic motion with a pariod π/ω

Answer: D

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16. A particle executes simple harmonic motion with a frequency. (f). The frequency with which its kinetic energy oscillates is.

A. $f2$

B. f

C. $2f$

D. $4f$

Answer: C

Watch Video Solution

17. The mass and diameter of a planet are twice those of earth. What will be the period of oscillation of a pendulum on this plenet. If it is a 2 second's pendulum on earth?

A. $\frac{1}{\sqrt{2}\,\text{sec}}$

B. $2\sqrt{2}\,\text{sec}$

C. $2\,\text{sec}$

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

Answer: B

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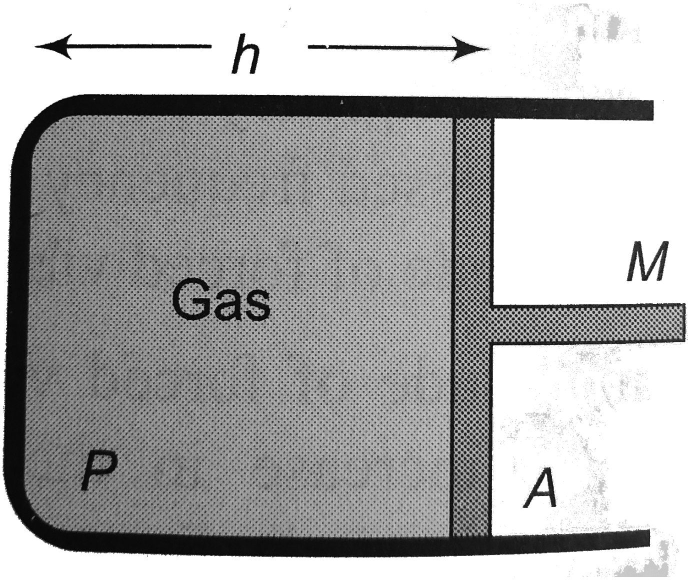
18. A cylinder piston of mass M sides smoothly inside a long cylinder closed at and enclosing a certain mass of gas The cylinder is kept with its axis horizontal if the piston is distanced from its equations positions it oscillation simple harmonically .The period of oscillation will be



A. $T = 2\pi\sqrt{\left(\frac{Mh}{PA}\right)}$

B. $T = 2\pi\sqrt{\left(\frac{MA}{Pb}\right)}$

C. $T = 2\pi\sqrt{\left(\frac{M}{PAh}\right)}$

D. $T = 2\pi\sqrt{MPhA}$

Answer: A

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19. Two bodies P and Q of equal masses are suspended from two separate massless springs of force constants k_1 and k_2 respectively. If the two bodies oscillate vertically such that their maximum velocities are equal. The ratio of the amplitude of P to that of Q is

A. $\frac{k_1}{K_2}$

B. $\sqrt{\frac{k_1}{K_2}}$

C. $\dfrac{k_2}{K_1}$

D. $\sqrt{\dfrac{k_2}{K_1}}$

Answer: D

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20. The displacement y of a particle executing periodic motion is given by

$$y = 4\cos^2\left(\frac{1}{2}t\right)\sin(1000t)$$

This expression may be considereed to be a result of the superposition of

A. Two

B. Three

C. Four

D. Five

Answer: B

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21. One end of a long metallic wire of length (L) is tied to the ceiling. The other end is tied to a massless spring of spring constant . (K.A) mass

(m) hangs freely from the free end of the spring. The area of cross- section and the Young's modulus of the wire are (A) and (Y) respectively. If the mass is slightly pulled down and released, it will oscillate with a time period (T) equal to :

A. $2\pi\left(\frac{m}{k}\right)$

B. $2\pi\left[\frac{(TA+KL)m}{LAK}\right]^{1/2}$

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

D. $2\pi\frac{mL}{YL}$

Answer: B

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

A. proportional to $\frac{1}{\sqrt{a}}$

B. proportional to a

C. proportional to $\sqrt{a}$

D. proportional to $a^{1/2}$

Answer: A

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23. A spring of Force- constant K is cut into two pieces sach that one piece is double the length of the other . Then the long pieces will have a force - constant of

A. $(2/3)k$

B. $(3/2)k$

C. $3k$

D. $6k$

Answer: B

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

A. $2\pi\sqrt{\dfrac{L}{g\cos\alpha}}$

B. $2\pi\sqrt{\dfrac{L}{g\sin\alpha}}$

C. $2\pi\sqrt{\dfrac{L}{g}}$

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

Answer: A

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25. An ideal spring with spring - constant K is bung from the colling and a block of mass M is attached to its lower end the mass is released with the spring initally unstetched . Then the maximum exlemsion in the spring is

A. $4Mg / K$

B. $2Mg/K$

C. Mg/K

D. $Mg/2K$

Answer: B

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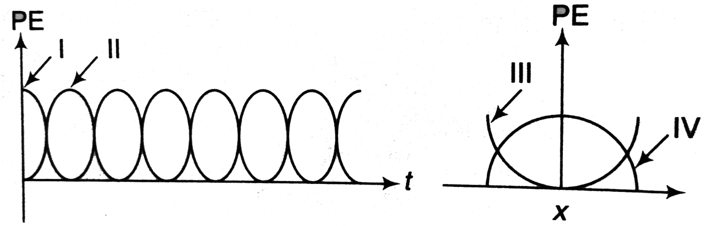
26. For a particle executing SHM, the displacement x is given by $x = A\cos\omega t$. Identify the graph which represents the variation of potential energy (PE) as a function of time t and displacement x.



(a) I, III

(b) II, IV (c) II, III

(d) I, IV

A. I,III

B. II,IV

C. II,III

D. I,IV

Answer: A

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

A. $2/3$

B. $5/6$

C. $6/5$

D. $3/2$

Answer: C

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

Reason : Displacement and velocity of SHM differ in phase by $\frac{\pi}{2}$

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: B

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29. STATEMENT-1 : The height of a liquid column in a U-tube is $0.3m$. If the liquid in one of the limbs is depressed, and then released, the time period of liquid column will be $1.1\,\text{sec}$.

STATEMENT-2 : this follows from the relation.

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

A. If both assertion and reason are true and the reasopn is correct explanation of the assertion

B. If both assertion and reason are true and but not the correct explanation of

assertion

C. If the assertion is true but reason is false

D. If both the assertion and reason are false

Answer: A

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