PHYSICS

NEET

CRASH COURSE

SIMPLE HARMONIC MOTION

SMART ACHIEVERS

JEE | NEET | FOUNDATION

855, Nitikhand-1, Indirapuram, Gzb.

7292077839 / 7292047839 | smartachievers.online

A Unit of SMARTACHIEVERS LEARNING Pvt. Ltd., Delhi

SIMPLE HARMONIC MOTION

Q.1 A particle starts S.H.M. from the mean position. Its amplitude is A and time period is T. At the time when its speed is half of the maximum speed, its displacement Y is

(1) $\frac{A}{2}$ (2) $\frac{A}{\sqrt{2}}$ (3) $\frac{A\sqrt{3}}{2}$ (4) $\frac{2A}{\sqrt{3}}$

Q.2 A body of mass 5 gm is executing S.H.M. about a point with amplitude 10 cm. Its maximum velocity is 100 cm/sec. Its velocity will be 50 cm/sec at a distance

(1) 5 (2) $5\sqrt{2}$ (3) $5\sqrt{3}$ (4) $10\sqrt{2}$

Q.3 The displacement of a particle moving in S.H.M. at any instant is given by y = a sin ωt. The acceleration after time $t = \frac{T}{4}$ is (where T is the time period)

(1) aω (2) –aω (3) $a\omega^2$ (4) $-a\omega^2$

Q.4 For a particle executing simple harmonic motion, the kinetic energy K is given by $K = K_0 \cos^2 \omega t$. The maximum value of potential energy is

(1) K_0 (2) Zero (3) $\frac{K_0}{2}$ (4) Not obtainable

Q.5 The P.E. of a particle executing SHM at a distance x from its equilibrium position is :

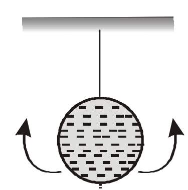
(1) $\frac{1}{2}m\omega^2x^2$ (2) $\frac{1}{2}m\omega^2a^2$ (3) $\frac{1}{2}m\omega^2(a^2 - x^2)$ (4) Zero

Q.6 Two bodies M and N of equal masses are suspended from two separate massless spring 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 M to to that of N is :

(1) $\frac{k_1}{k_2}$ (2) $\sqrt{\frac{k_1}{k_2}}$ (3) $\sqrt{\frac{k_2}{k_1}}$ (4) $\frac{k_2}{k_1}$

Q.7 The period of a simple pendulum is doubled, when
(1) Its length is doubled
(2) The mass of the bob is doubled
(3) Its length is made four times
(4) The mass of the bob and the length of the pendulum are doubled

Q.8 A simple pendulum is made of a body which is a hollow sphere containing mercury suspended by means of a wire. If a little mercury is drained off, the period of pendulum will :



(1) Remains unchanged (2) Increases
(3) Decreases (4) Become erratic

Q.9 The distance between the point of suspension and the centre of gravity of a compound pendulum is 2)21 and the radius of gyration about the horizontal axis through the centre of gravity is k, then its time period will be:

(1) $2\pi\sqrt{\frac{\lambda + k}{g}}$ (2) $2\pi\sqrt{\frac{\lambda^2 + k^2}{\lambda g}}$ (3) $2\pi\sqrt{\frac{\lambda + k^2}{g}}$ (4) $2\pi\sqrt{\frac{2k}{\lambda g}}$

Q.10 For a compound pendulum, the maximum time period is:

(1) $2\pi\sqrt{\frac{L}{g}}$ (2) $2\pi\sqrt{\frac{2k}{g}}$ (3) Zero (4) Infinite

Q.11 A disc of radius R is suspended from its circumference and made to oscillate. Its time period will be:

(1) $2\pi\sqrt{\frac{3R}{2g}}$ (2) $2\pi\sqrt{\frac{4R}{g}}$ (3) $2\pi\sqrt{\frac{R}{g}}$ (4) $2\pi\sqrt{\frac{2R}{g}}$

Q.12 The S.H.M. of a particle is givne by the equation $y = 3 \sin \omega t + 4 \cos \omega t$. The amplitude is :

(1) 7 (2) 1 (3) 5 (4) 12

Q.13 Two mutually perpendicular simple harmonic vibrations have same amplitude, frequency and phase. When they superimpose, the resultant form of vibration will be :

(1) A circle (2) An ellipse (3) A straight line (4) A parabola

Q.14 A S.H.M. is represents by $x = 5\sqrt{2}(\sin 2\pi t + \cos 2\pi t)$. The amplitude of the S.H.M. is :

(1) 10 cm (2) 20 cm (3) $5\sqrt{2}$ cm (4) 50 cm

Q.15 A particle executing S.H.M. completes a distance (taking friction as negligible) in one complete time period, equal to :

(1) Four times the amplitude (2) Two times the amplitude
(3) One times the amplitude (4) Eight times the amplitude

Q.16 The equation of motion of a particle executing S.H.M. is :

(1) $\frac{d^2x}{dt^2} = -\frac{k}{m}x$ (2) $\frac{d^2x}{dt^2} = +\omega^2 x$ (3) $\frac{d^2x}{dt^2} = -\omega^2 x^2$ (4) $\frac{d^2x}{dt^2} = -kmx$

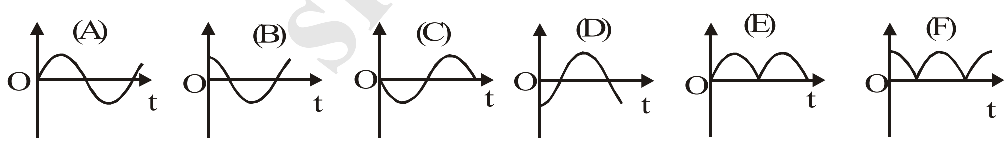
Q.17 The phase of a particle in SHM at time t is $\pi/6$. The following inference is drawn from this:

(1) The particle is at x = a/2 and moving in + X-direction
(2) The particle is at x = a/2 and moving in – X-direction
(3) The particle is at x = –a/2 and moving in + X-direction
(4) The particle is at x = –a/2 and moving in – X-direction

Q.18 The time taken by a particle in SHM for maximum displacement is :

(1) T/8 (2) T/6 (3) T/2 (4) T/4

Q.19 The displacement of a particle in S.H.M. is $x = a \sin\omega t$. Which of the following graph between displacement and time is correct :



(1) A (2) B (3) C (4) D

Q.20 The energy at the mean position of a pendulum will be :

(1) Zero (2) Partial P.E. and partial K.E.
(3) Totally K.E. (4) Totaly P.E.

Q.21 The average P.E. of a body executing S.H.M. is :

(1) $\frac{1}{2}ka^2$ (2) $\frac{1}{4}ka^2$ (3) ka^2 (4) Zero

Q.22 The time taken for a second pendulum from one extreme point to another is :

(1) 1 sec. (2) 2 sec. (3) 1/2 sec. (4) 4 sec.

Q.23 The displacement of a particle from its mean position (in m) varies with time according to the relation $y = 0.2 \sin(10\pi t + 1.5\pi)\cos(10\pi t + 1.5\pi)$. The motion of the particle is

(1) not simple harmonic
(2) simple harmonic with time period 0.2 s.
(3) simple harmonic with time period 0.1 sec
(4) along a circular path

Q.24 The differential equation representing the S.H.M. of a particle is $\frac{d^2x}{dt^2} + \omega^2 x = 0$. The natural frequency of the particle is then given by

(1) ω (2) $\frac{2\pi}{\omega}$ (3) $\frac{\omega}{2\pi}$ (4) $2\pi\omega$

Q.25 The displacement of a particle (in meters) from its mean position is given by the equation

$$y = 0.2\left(\cos^2\frac{\pi t}{2} - \sin^2\frac{\pi t}{2}\right)$$

The motion of the above particle is
(1) not simple harmonic
(2) simple harmonic with amplitude 0.2 m
(3) simple harmonic with the period double that of a second's pendulum
(4) simple harmonic with amplitude 0.4 m.

Q.26 The motion of a particle varies with time according to the relation $y = a(\sin\omega t + \cos\omega t)$

(1) the motion is oscillatory but not S.H.M.
(2) the motion is S.H.M. with amplitude a
(3) the motion is S.H.M. with amplitude $a\sqrt{2}$
(4) the motion is S.H.M. with amplitude 2a

Q.27 Both the equations $y_1 = A\sin\omega t$ and. $y_2 = \frac{A}{2}\sin\omega t + \frac{A}{2}\cos\omega t$ represent S.H.M. The ratio of the amplitudes of the two motions is

(1) 1 (2) 2 (3) 0.5 (4) $\sqrt{2}$

Q.28 The displacement of particle executing S.H.M. is given by $y = 5\sin 20\pi t$. Its frequency is

(1) 10 Hz (2) 20π Hz (3) 0.1 Hz (4) 20Hz

Q.29 The equation of a simple harmonic oscillator with amplitude 5 cm and period 2 sec is if particle is starting from the mean positions is –

(1) $y = 5\sin\pi t$ (2) $y = 2\sin 2\pi t/5$ (3) $y = 5\cos\pi t$ (4) $y = 5\sin 2\pi t/5$

Q.30 Two identical pendulums oscillate with a constant phase difference $\frac{\pi}{4}$ and same amplitude. The maximum velocity of one is v. The maximum velocity of the other will be

(1) v (2) $\sqrt{2}v$ (3) $2v$ (4) $\frac{v}{\sqrt{2}}$

Q.31 The function $\sin^2(\omega t)$ represents :

(1) a simple harmonic motion with a period $\frac{2\pi}{\omega}$

(2) a simple harmonic motion with a period π/ω

(3) a periodic, but not simple harmonic motion with a period $\frac{2\pi}{\omega}$

(4) a periodic, but not simple harmonic motion with a period $\frac{\pi}{\omega}$

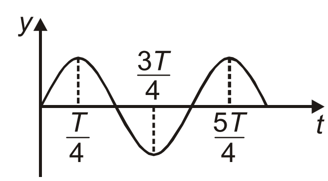
Q.32 The equation of S.H.M. of a particle is $\frac{d^2y}{dt^2} + ky = 0$, where k is a positive constant. The time period of motion is given by

(1) $\frac{2\pi}{\sqrt{k}}$ (2) $\frac{2\pi}{k}$ (3) $2\pi k$ (4) $2\pi\sqrt{k}$

Q.33 A particle executing S.H.M. has maximum velocity 'α' and maximum acceleration β, the period of oscillation shall be

(1) $2\pi\ (\alpha/\beta)$ (2) $2\pi\ (\beta/\alpha)$ (3) $2\pi\ (\alpha/\beta)^{1/2}$ (4) $2\pi\ (\beta/\alpha)^{1/2}$

Q.34 Displacement time graph for a particle executing S.H.M. is as shown



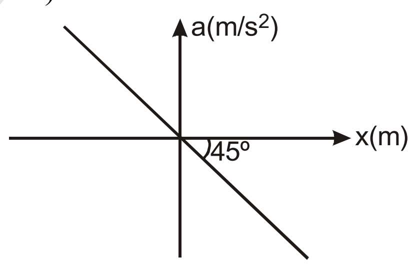
(1) Velocity of the particle is positive for $\frac{T}{4} < t < \frac{3T}{4}$

(2) Velocity of the particle is negative for $\frac{T}{2} < t < T$

(3) Acceleration of the particle is positive for $\frac{T}{4} < t < \frac{3T}{4}$

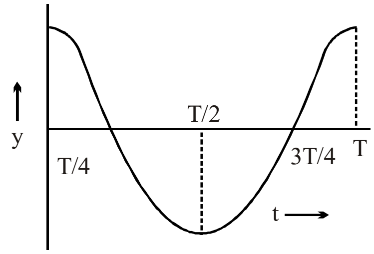
(4) Acceleration of the particle is positive for $\frac{T}{2} < t < T$

Q.35 Acceleration-displacement graph of a particle executing SHM is as shown in given figure. The time period of its oscillation is: (in sec)



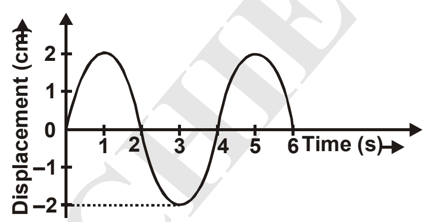
(1) $\frac{\pi}{2}$ (2) 2π (3) π (4) $\frac{\pi}{4}$

Q.36 The graph in the figure shows how the displacement of a particle describing S.H.M. varies with time. Which one of the following statements is not true ?



(1) the force is zero at time $\frac{3T}{4}$
(2) the velocity is maximum at time T/2
(3) the acceleration is maximum at time T
(4) the P.E. = total energy at time T/2

Q.37 The given figure shows the displacement-time graph of a simple harmonic oscillator. The amplitude, time period and initial phase of the oscillator are respectively



(1) 1 cm, 2 s, $\frac{\pi}{2}$
(2) 2 cm, 4 s, $\frac{\pi}{4}$
(3) 2 cm, 4 s, zero
(4) 2 cm, 2 s, zero

Q.38 The phase of a particle executing S.H.M with equation $x = A \sin\omega t$ is $\pi/2$ when it has
(1) maximum displacement
(2) maximum velocity
(3) maximum energy
(4) none of the above

Q.39 For a particle executing SHM, which of the following statements does not hold good ?
(1) the total energy of the particle always remains the same
(2) the restoring force is always directed towards a fixed point
(3) the restoring force is maximum at the extreme positions
(4) the velocity of the particle is minimum at the centre of motion of the particle

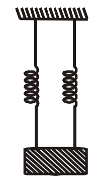
Q.40 A simple pendulum can attain a maximum height h. Then its maximum velocity v will be :
(1) $\sqrt{2gh}$
(2) $2\sqrt{gh}$
(3) $\sqrt{2}gh$
(4) $4g^2h^2$

Q.41 The total energy of a particle executing S.H.M. is proportional to
(1) displacement from equilibrium position
(2) frequency of oscillation
(3) velocity in equilibrium position
(4) square of amplitude of motion

Q.42 For a body in SHM as it moves from either extremities to the mean position its :
(1) PE decreases KE increases
(2) KE decreases PE increases
(3) both PE and KE increases
(4) both PE and KE decreases

Q.43 Let T_1 and T_2 be the time periods of two springs A and B when a mass m is suspended from them separately. Now both the springs are connected in parallel and same mass m is suspended with them. Now let T be the time period in this position. Then:
(1) $T = T_1 + T_2$
(2) $T = \frac{T_1T_2}{T_1 + T_2}$
(3) $T^2 = T_1^2 + T_2^2$
(4) $\frac{1}{T^2} = \frac{1}{T_1^2} + \frac{1}{T_2^2}$

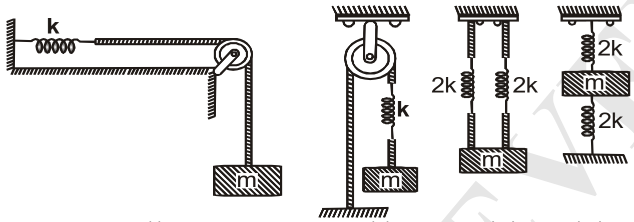
Q.44 An object suspended from a spring exhibits oscillations of period T. Now the spring is cut in two halves and the same object is suspsended with two halves as shown in figure. The new time period of oscillation will become:



(1) $\frac{T}{\sqrt{2}}$ (2) 2T

(3) $\frac{T}{2}$ (4) $\frac{T}{2\sqrt{2}}$

Q.45 A block of mass m is suspended by different springs of force constant shown in figure.



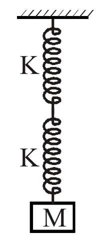
(i) (ii) (iii) (iv)

Let time period of oscillation in these four positions be T_1, T_2, T_3 and T_4. Then :

(1) $T_1 = T_2 = T_4$ (2) $T_1 = T_2$ and $T_3 = T_4$

(3) $T_1 = T_2 = T_3$ (4) $T_1 = T_3$ and $T_2 = T_4$

Q.46 The system shown in the figure, when slightly displaced and relased oscillates with a period 'T'. If only one spring is used, the period of oscillation will be -



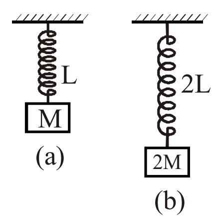
(1) T

(2) T/2

(3) $\frac{T}{\sqrt{2}}$

(4) 2T

Q.47 Two springs of the same material but of length L and 2L are suspended with masses M and 2M attached at their lower ends. Their time periods when they are allowed to oscillate will be in the ratio



(1) 1 : 2

(2) 2 : 1

(3) 1 : 4

(4) 4 : 1

Q.48 A rubber ball filled with water, having a small hole is used as the bob of a simple pendulum. The time period of such a pendulum

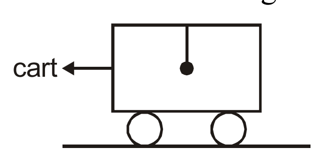
(1) is a constant

(2) decreases with time

(3) increases with time

(4) first increases and then decreases finally having same value as at the beginning

Q.49 The simple pendulum shown here has time period T if the cart moves with constant speed. With what acceleration should the cart move so that the time period is $\frac{T}{\sqrt{2}}$? (g is acceleration due to gravity)



(1) g (2) $\sqrt{2}\,g$

(3) $\sqrt{3}\,g$ (4) $2\,g$

Q.50 The period of a simple pendulum is measured as T_0 in a stationary lift. If the lift moves upward with an acceleration of 5g, the period will be -
(1) the same (2) increased by 3/5
(3) decreased by 2/3 times (4) none of the above

Q.51 A simple pendulum suspended from the ceiling of a stationary trolley has a length ℓ. Its period of oscillation is $2\pi\sqrt{\lambda/g}$. What will be its period of oscillation if the trolley moves forward with an acceleration f ?
(1) $2\pi\sqrt{\frac{\lambda}{f-g}}$ (2) $2\pi\sqrt{\frac{\lambda}{f+g}}$ (3) $2\pi\sqrt{\frac{\lambda}{(f^2+g^2)^{1/2}}}$ (4) $2\pi\sqrt{\frac{\lambda}{f^2-g^2}}$

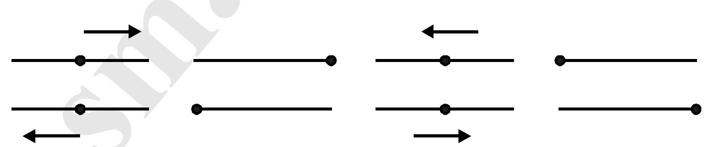
Q.52 A simple pendulum is set up in a trolley which moves to the right with an acceleration a on a horizontal plane. Then the thread of the pendulum in the mean position makes an angle θ with the vertical
(1) $\tan^{-1}$ a/g in the forward direction (2) $\tan^{-1}$ a/g in the backward direction
(3) $\tan^{-1}$ g/a in the backward direction (4) $\tan^{-1}$ g/a in the forward direction

Q.53 A simple pendulum is executing simple harmonic motion with a time period T. If the length of the pendulum is increased by 21%, the increases in the time period of the pendulum of increased length is :
(1) 10% (2) 21% (3) 30% (4) 50%

Q.54 The time period of a particle in simple harmonic motion is equal to the time between consecutive appearances of the particle at a particular point in its motion. This point is
(1) the mean position
(2) an extreme position
(3) between the mean position and the positive extreme
(4) between the mean position and the negative extreme

Q.55 The time period of a particle in simple harmonic motion is equal to the smallest time between the particle acquiring a particular velocity $\vec{v}$. The value of v is
(1) v_{max} (2) 0
(3) between 0 and v_{max} (4) between 0 and $-v_{max}$

Q.56 Figure represents two simple harmonic motion.



The parameter which has different values in the two motions is
(1) amplitude (2) frequency
(3) phase (4) maximum velocity

Q.57 Which of the following quantities are always non-negative in a simple harmonic motion ?
(1) $\vec{F}\cdot\vec{a}$ (2) $\vec{v}\cdot\vec{r}$ (3) $\vec{a}\cdot\vec{r}$ (4) $\vec{F}\cdot\vec{r}$

Q.58 Which of the following quantities are always non zero in a simple harmonic motion ?

(1) $\vec{F}\times\vec{a}$ (2) $\vec{v}\times\vec{r}$ (3) $\vec{a}\times\vec{r}$ (4) None of these

Q.59 A particle executes simple harmonic motion with an amplitude of 10 cm and time period 6s. At t = 0 it is at position x = 5 cm going towards positive x-direction. Write the equation for the displacement x at time t :

(1) $10\sin\left(\frac{\pi}{3}t+\frac{\pi}{6}\right)$ (2) $10\sin\left(\frac{\pi}{6}t+\frac{\pi}{3}\right)$ (3) $10\sin\left(\frac{\pi}{3}t+\frac{\pi}{3}\right)$ (4) $10\sin\left(\frac{\pi}{6}t+\frac{\pi}{6}\right)$

Q.60 The equation of motion of a particle started at t = 0 is given by x = 5 sin (20t + π/3) where x is in centimetre and t in second. When does the particle

(a) first come to rest

(b) first have zero acceleration

(c) first have maximum speed ?

(1) $\frac{\pi}{120},\frac{\pi}{120},\frac{\pi}{120}$ (2) $\frac{\pi}{30},\frac{\pi}{30},\frac{\pi}{30}$ (3) $\frac{\pi}{120},\frac{\pi}{30},\frac{\pi}{30}$ (4) $\frac{\pi}{30},\frac{\pi}{120},\frac{\pi}{120}$

Q.61 A particle is executing S.H.M. of amplitude 'a' and time period = 4 second. Then the time taken by it to move from the extreme position to half the amplitude is

(1) 1 sec (2) $\frac{1}{3}$ sec (3) $\frac{2}{3}$ sec (4) $\frac{4}{3}$ sec

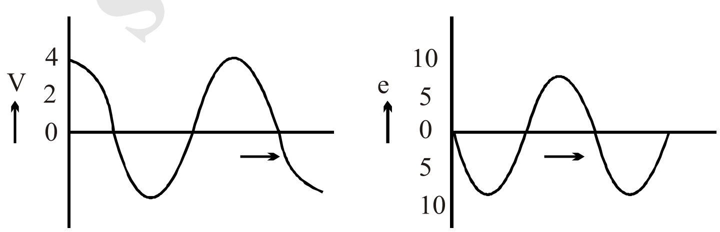
Q.62 A particle is executing S.H.M. between $x = \pm$ a. The time taken to go from 0 to $\frac{a}{2}$ is T_1 and to go from $\frac{a}{2}$ to a is T_2, then

(1) $T_1 < T_2$ (2) $T_1 > T_2$ (3) $T_1 = T_2$ (4) $T_1 = 2T_2$

Q.63 Instantaneous displacement of a harmonic oscillator is given by $y = A\cos\left(\omega t+\frac{\pi}{6}\right)$. Its speed is maximum at time

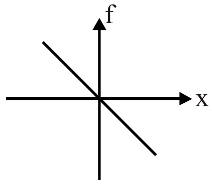
(1) $\frac{\pi}{3\omega}$ (2) $\frac{4\pi}{3\omega}$ (3) $\frac{\pi}{6\omega}$ (4) Both (A) & (B)

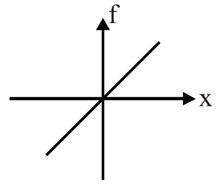
Q.64 The figure shows the graph between velocity(v) and acceleration (a) in SI units; then frequency of oscillations is

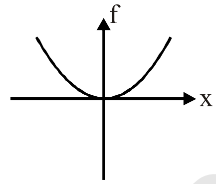


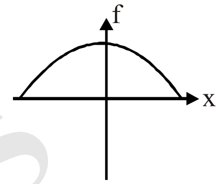
(1) 1.25/π (2) 2.5 (3) π/ 1.25 (4) 1/1.25

Q.65 The variation of the acceleration (f) of the particle executing S.H.M. with its displacement (X) is represented by the curve -

(1) 

(2) 

(3) 

(4) 

Q.66 The total mechanical energy of a spring-mass system in simple harmonic motion is $E = \frac{1}{2} m\omega^2 A^2$.

Suppose the oscillating particle is replaced by another particle of double mass but oscillating with same amplitude. The new mechanical energy will

(1) become 2E (2) become E/2 (3) become $\sqrt{2}$ E (4) remain E

Q.67 The average energy in one time period in simple harmonic motion is

(1) $\frac{1}{2} m\omega^2 A^2$ (2) $\frac{1}{4} m\omega^2 A^2$ (3) $m\omega^2 A^2$ (4) zero

Q.68 A particle executes simple harmonic motion with a frequency v . The frequency with which the kinetic energy oscillates is

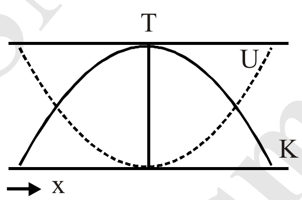
(1) v/2 (2) v (3) 2v (4) zero

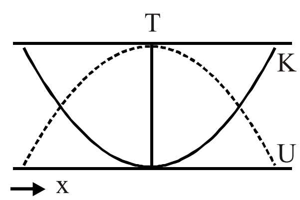
Q.69 A particle of mass m is executing oscillations about the origin on the x-axis. Its potential energy is $U(x) = k|x|^3$, where k is a positive constant. If the amplitude of oscillation is a, then its time period T is :

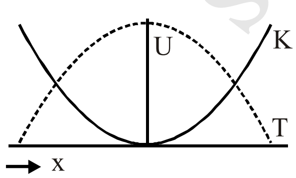
(1) proportional to $\frac{1}{\sqrt{a}}$ (2) indendent of a

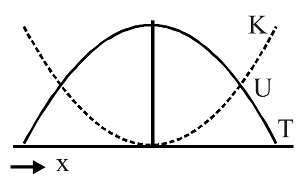
(3) proportional to $\sqrt{a}$ (4) proportional to $a^{3/2}$

Q.70 A particle is executing S.H.M. along a straight line. The graph showing the variation of kinetic, potential and total energy K, U and T respectively with displacement is -

(1) 

(2) 

(3) 

(4) 

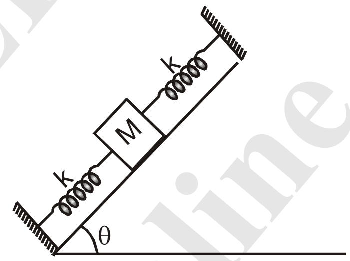
Q.71 A spring-mass system oscillates with a frequency v. If it is taken in an elevator slowly accelerating upward, the frequency will

(1) increase (2) decrease (3) remain same (4) become zero

Q.72 A spring-mass system oscillates in a car. It the car acceerates on a horizontal road, the frequency of oscillation will

(1) increase (2) decrease (3) remain same (4) become zero

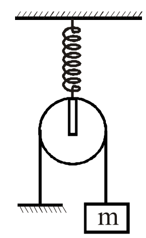
Q.73 On a smooth inclined plane a body of mass M is attached between two springs. The other ends of the spring are fixed to ffirm supports. If each spring has a force constant k, the period of oscillation of the body is: (assuming the spring as massless)



(1) $2\pi\sqrt{\frac{M}{2k}}$ (2) $2\pi\sqrt{\frac{2M}{k}}$

(3) $2\pi\sqrt{\frac{M\sin\theta}{2k}}$ (4) $2\pi\sqrt{\frac{2M\sin\theta}{k}}$

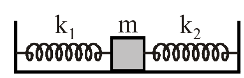
Q.74 In fig the spring has a force constant k. The pulley is light and smooth, the spring and the string are light. The suspended block has a mass m kg. If the block is slightly displaced vertically down from its equilibrium position and released then the period of its vertical oscillations.



(1) $T = 2\pi\sqrt{\frac{m}{k}}$ (2) $T = 4\pi\sqrt{\frac{m}{k}}$

(3) $T = 2\pi\sqrt{\frac{k}{m}}$ (4) $T = 4\pi\sqrt{\frac{k}{m}}$

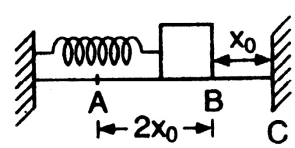
Q.75 A block of mass m is connected between two springs (constants K_1 and K_2) as shown in the figure and is made to oscillate, the frequency of oscillation of the system shall be -



(1) $\frac{1}{2\pi}\left(\frac{m}{K_1+K_2}\right)^{1/2}$ (2) $\frac{1}{2\pi}\left(\frac{K_1K_2}{(K_1+K_2)m}\right)^{1/2}$

(3) $\frac{1}{2\pi}\left(\frac{K_1+K_2}{m}\right)^{1/2}$ (4) $\frac{1}{2\pi}\left(\frac{(K_1+K_2)m}{K_1K_2}\right)^{1/2}$

Q.76 One end of a spring of force constant k is fixed to a vertical wall and the other to a body of mass m resting on a smooth horizontal surface. There is another wall at a distance x_0 from the body. The spring is then compressed by $2x_0$ and released. The time taken to strike the wall is :



(1) $\frac{\pi}{6}\sqrt{\frac{k}{m}}$ (2) $\sqrt{\frac{k}{m}}$

(3) $\frac{2\pi}{3}\sqrt{\frac{m}{k}}$ (4) $\frac{\pi}{4}\sqrt{\frac{k}{m}}$

Q.77 The equation of motion of two particles executing S.H.M. are

$y_1 = 10 \sin\left(10\pi t + \frac{\pi}{3}\right)$ m and $y_2 = 10 \cos\left(8\pi t + \frac{\pi}{4}\right)$ m

The phase difference between these particles at t = 0.5s is

(1) $\frac{7\pi}{12}$ (2) $\frac{13\pi}{12}$ (3) $\frac{9\pi}{12}$ (4) $\frac{\pi}{12}$

Q.78 The displacement of a particle is given by $\vec{r} = A(\hat{i}\cos\omega t + \hat{j}\sin\omega t)$. The motion of the particle is

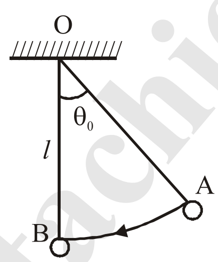
(1) simple harmonic (2) on a straight line
(3) on a circle (4) with constant acceleration

Direction for following questions :

A. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
C. Assertion is true but Reason is false.
D. Assertion and Reason both are false.

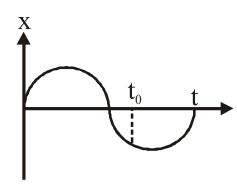
Q.79 **Assertion :** In x = 3 + 4 cosωt amplitude of oscillation is 4 units.
Reason : Mean position is at x = 3.
(1) A (2) B (3) C (4) D

Q.80 **Assertion :** Bob is released from rest from position A. Given θ_0 very small. Angular velocity of bob about point O is maximum and $\left(\frac{g}{\lambda}\right)\theta_0$ at point O.



Reason : For small angular amplitudes motion of bob is simple harmonic.
(1) A (2) B (3) C (4) D

Q.81 **Assertion :** In the x-t graph of a particle in SHM acceleration of particles at time t_0 is positive but velocity is negative.
Reason : $a \propto -x$ and velocity is slope of x-t graph.
(1) A (2) B (3) C (4) D

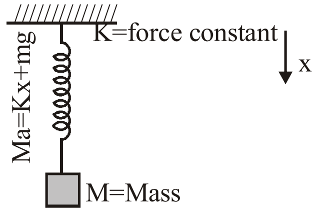


Q.82 **Assertion :** Average kinetic energy in one osciilation during SHM of a body is $\frac{1}{4}m\omega^2A^2$.

Reason : Maximum kinetic energy is $\frac{1}{2}m\omega^2A^2$.

(1) A (2) B (3) C (4) D

Q.83 **Assertion :** For simple harmonic motion acceleration must be proportional to displacement and is directed towards the mean position.



Reason : Consider motion for a mass spring system under gravity, motion of M is not a simple harmonic motion unless Mg is negligibly small.

(1) A (2) B (3) C (4) D

Q.84 **Assertion :** If the amplitude of a simple harmonic oscillator is doubled, it total energy becomes four times.
Reason : The total energy is directly proportional to the square of amplitude of vibration of the harmonic oscillator.

(1) A (2) B (3) C (4) D

Q.85 **Assertion :** The periodic time of a hard spring is less as compared to that of a soft spring.
Reason : The periodic time depends upon the spring constant, and spring constant is large for hard spring.

(1) A (2) B (3) C (4) D

Q.86 **Assertion :** SHM is not a periodic motion.
Reason : Periodic motion does not repeat its position after certain interval of time.

(1) A (2) B (3) C (4) D

Q.87 **Assertion :** When a particle is at extreme position performing SHM, its momentum is equal to zero.
Reason : At extreme position the velocity of particle performing SHM is equal to zero.

(1) A (2) B (3) C (4) D

Q.88 **Assertion :** When a girl sitting on a swing stand up, the periodic time of the swing will increase.
Reason : In standing position of a girl, the effective length of the swing will decrease.

(1) A (2) B (3) C (4) D

ANSWER KEY

Q.1	3	Q.2	3	Q.3	4	Q.4	1	Q.5	1
Q.6	3	Q.7	3	Q.8	2	Q.9	2	Q.10	4
Q.11	1	Q.12	3	Q.13	3	Q.14	1	Q.15	1
Q.16	1	Q.17	1	Q.18	4	Q.19	4	Q.20	3
Q.21	2	Q.22	1	Q.23	3	Q.24	3	Q.25	2
Q.26	3	Q.27	4	Q.28	1	Q.29	1	Q.30	1
Q.31	2	Q.32	1	Q.33	1	Q.34	4	Q.35	2
Q.36	2	Q.37	3	Q.38	1	Q.39	4	Q.40	1
Q.41	4	Q.42	1	Q.43	4	Q.44	3	Q.45	2
Q.46	3	Q.47	1	Q.48	4	Q.49	3	Q.50	4
Q.51	3	Q.52	2	Q.53	1	Q.54	2	Q.55	1
Q.56	3	Q.57	1	Q.58	4	Q.59	1	Q.60	3
Q.61	3	Q.62	1	Q.63	4	Q.64	1	Q.65	1
Q.66	4	Q.67	1	Q.68	3	Q.69	1	Q.70	1
Q.71	3	Q.72	3	Q.73	1	Q.74	2	Q.75	3
Q.76	3	Q.77	3	Q.78	3	**Q.79**	**2**	**Q.80**	**2**
Q.81	1	Q.82	2	Q.83	3	Q.84	1	Q.85	1
Q.86	**4**	**Q.87**	**1**	**Q.88**	**4**				