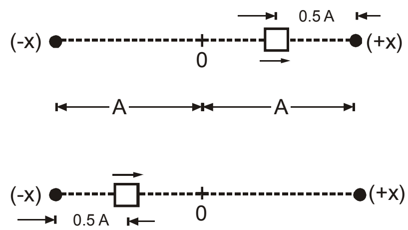
SIMPLE HARMONIC MOTION-LEVEL 1

1. The equation of motion of a particle of mass 1 g is $\frac{d^2x}{dt^2} + \pi^2 x = 0$ where x is displacement(in m)from mean position . The frequency of oscillation is (in Hz) :

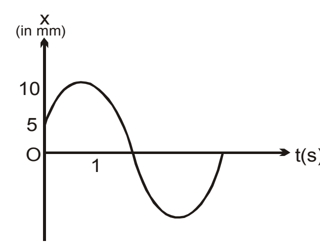
(A) $\frac{1}{2}$ (B) 2 (C) $5\sqrt{10}$ (D) $\frac{1}{5\sqrt{10}}$

2. Two bodies performing S.H.M. have same amplitude and frequency. Their phases at a certain instant are as shown in the figure. The phase difference between them is



(A) $\frac{11}{6}\pi$ (B) π (C) $\frac{5}{3}\pi$ (D) $\frac{3}{5}\pi$

3. The figure shows the displacement time graph of a particle executing S.H.M. If the time period of oscillation is 2 s the equation of motion of its SHM is



(A) $x = 10\sin(\pi t + \pi/3)$
(B) $x = 10\sin \pi t$
(C) $x = 10\sin(\pi t + \pi/6)$
(D) x = 10 sin (2pt+p/6)

4. Two particle executes S.H.M. of same amplitude and frequency along the same straight line. They pass one another when going in opposite directions, each time their displacement is half of their amplitude. The phase difference between them is :–

(A) 30 (B) 60 (C) 90 (D) 120

5. A small mass executes linear S.H.M. about O with amplitude 'a' and period 'T'. Its displacement from O at time T/8 after passing through O is

(A) a/8 (B) $\frac{a}{2\sqrt{2}}$ (C) a/2 (D) $\frac{a}{\sqrt{2}}$

6. Two particles A and B perform SHM along the same straight line with the same amplitude 'a', same frequency 'f' and same equilibrium position 'O'. The greatest distance between them is found to be 3a/2. At some instant of time they have the same displacement from mean position. What is this displacement?

(A) a/2 (B) $a\sqrt{7}/4$ (C) $\sqrt{3}/a2$ (D) 3a/4

7. A particle executes S.H.M. along a straight line with mean position x = 0, period 20 s and amplitude 5 cm. The shortest time taken by the particle to go from x = 4 cm to x = –3cm is

(A) 4 s (B) 7 s (C) 5 s (D) 6 s

8. A particle performing S.H.M. is found at its equilibrium at t = 1 s and it is found to have a speed of 0.25 m/s at t = 2 s. If the period of oscillation is 6s Calculate amplitude of oscillation

(A) $\frac{3}{2\pi}$ m (B) $\frac{3}{4\pi}$ m (C) $\frac{6}{\pi}$ m (D) $\frac{3}{8\pi}$ m

9. A particle executes S.H.M. in a straight line. In the first second starting from rest it travels a distance 'a' and in the next second a distance 'b' in the same direction. The amplitude of S.H.M. will be

(A) $\frac{2a^2}{3a-b}$ (B) a – b (C) 2a – b (D) a / b

10. A particle is subjected to two mutually perpendicular simple harmonic motions such that its x and y coordinates are given by: x = 2 sin ωt; y = 2 sin $\left(\omega t+\frac{\pi}{4}\right)$. The path of the particle will be

(A) an ellipse (B) a straight line (C) a parabola (D) a circle

11. The period of a particle is 8s. AT t = 0 it is at the mean position. The ratio of distance covered by the particle in first second and second will be-

(A) $\frac{\sqrt{2}-1}{\sqrt{2}}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{\sqrt{2}-1}$ (D) $[\sqrt{2}-1]$

12. A particle executes SHM with time period T and amplitude A. The maximum possible average velocity in time T/4 is

(A) $\frac{2A}{T}$ (B) $\frac{4A}{T}$ (C) $\frac{8A}{T}$ (D) $\frac{4\sqrt{2}A}{T}$

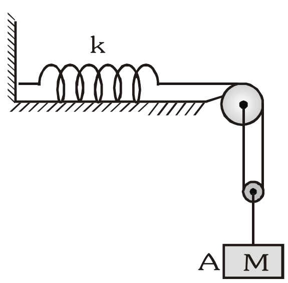
13. The time taken by a particle performing S.H.M. to pass from point A to B where its velocities are same is 2 seconds . After another 2 seconds it returns to B . The time period of oscillation is (in seconds) :

(A) 2 (B) 4 (C) 6 (D) 8

14. The P.E. of an oscillating particle at rest position is 15 J and its average K.E. is 5 J. The total energy of particle at any instant will be-

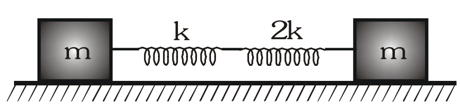
(A) 10 J (B) 20 J (C) 25 J (D) 5 J

15. Block A in the figure is released from the rest when the extension in the spring is x_0. The maximum downward displacement of the block.



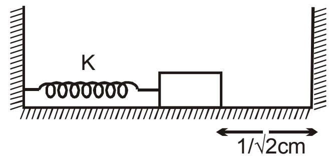
(A) $\frac{Mg}{2k}-x_0$ (B) $\frac{Mg}{2k}+x_0$ (C) $\frac{2Mg}{k}-x_0$ (D) $\frac{2Mg}{k}+x_0$

16. A system is shown in the figure. The time period for small oscillations 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) $2\pi\sqrt{\frac{3m}{8k}}$

17. A block of mass 0.9 kg attached to a spring of force constant K is compressed by $\sqrt{2}$ cm and the block is at a distance $\frac{1}{\sqrt{2}}$ cm from the wall. When the block is released, it makes elastic collision with the wall and its period of motion is 0.2 s. The value of K is (take $\pi^2=10$)



(A) 100 Nm^{-1} (B) 10 Nm^{-1} (C) 0.1 Nm^{-1} (D) 1 Nm^{-1}

18. The length of a spring is α when a force of 4 N is applied on it and the length is β when 5 N force is applied. Then the length of spring when 9 N force is applied is-
(A) $5\beta - 4\alpha$ (B) $\beta - \alpha$ (C) $5\alpha - 4\beta$ (D) $9(\beta - \alpha)$

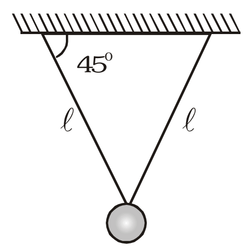
19. A horizontal spring is connected to a mass M. It executes simple harmonic motion. When the mass M passes through its mean position, an object of mass m is put on it and the two move together. The ratio of frequencies before and after will be-

(A) $\left(1+\frac{m}{M}\right)^{1/2}$ (B) $\left(1+\frac{m}{M}\right)$ (C) $\left(\frac{M}{M+m}\right)^{1/2}$ (D) $\left(\frac{M}{M+m}\right)$

20. A pendulum is suspended in a lift and its period of oscillation when the lift is stationary is T_0. What must be the acceleration of the lift for the period of oscillation of the pendulum to be $T_0/2$?
(A) 2g downward (B) 2g upward (C) 3g downward (D) 3g upward

21. Two simple pendulums, having periods of 2s and 3s respectively, pass through the mean position simultaneously at a particular instant. They may be in phase after an interval of :
(A) 5s (B) 3s (C) 1s (D) none of the above

22. Time period of small oscillation (in a vertical plane normal to the plane of strings) of the bob in the arrangement shown will be



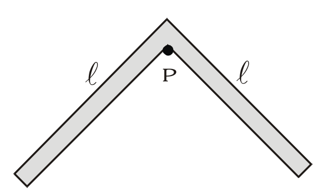
(A) $2\pi\sqrt{\frac{\ell}{g}}$ (B) $2\pi\sqrt{\frac{\ell}{\sqrt{2}g}}$

(C) $2\pi\sqrt{\frac{\sqrt{2}\ell}{g}}$ (D) $2\pi\sqrt{\frac{2\ell}{g}}$

23. The frequency of a simple pendulum is n oscillations per minute while that of another is (n + 1) oscillations per minute. The ratio of length of first pendulum to the length of second is-

(A) $\frac{n}{n+1}$ (B) $\left(n+\frac{1}{n}\right)^2$ (C) $\left(\frac{n+1}{n}\right)^2$ (D) $\left(\frac{n}{n+1}\right)^2$

24. A system of two identical rods (L-shaped) of mass m and length ℓ are resting on a peg P as shown in the figure. If the system is displaced in its plane by a small angle θ, find the period of oscillations



(A) $2\pi\sqrt{\frac{\sqrt{2}\ell}{3g}}$ (B) $2\pi\sqrt{\frac{2\sqrt{2}\ell}{3g}}$ (C) $2\pi\sqrt{\frac{2\ell}{3g}}$ (D) $3\pi\sqrt{\frac{\ell}{3g}}$

25. The distance of point of a compound pendulum from its centre of gravity is ℓ, the time period of oscillation relative to this point is T. If $g = \pi^2$, the relation between ℓ and T will be :–

(A) $\ell^2 - \left[\frac{T^2}{4}\right]\ell + k^2 = 0$ (B) $\ell^2 + \left[\frac{T^2}{4}\right]\ell + k^2 = 0$ (C) $\ell^2 - \left[\frac{T^2}{4}\right]\ell - k^2 = 0$ (D) $\ell^2 + \left[\frac{T^2}{4}\right]\ell - k^2 = 0$

26. A man of mass 60 kg standing on a plateform executing S.H.M. in the vertical plane . The displacement from the mean position varies as $y = 0.5 \sin (2\pi ft)$. The minimum value of f, for which the man will feel weightlessness at the highest point is : (y is in metres)

(A) $\frac{g}{4\pi}$ (B) $4\pi g$ (C) $\frac{\sqrt{2g}}{2\pi}$ (D) $2\pi\sqrt{2g}$

27. A heavy brass-sphere is hung from a spiral spring and it executes vertical vibrations with period T. The ball is now immersed in nonviscous liquid with a density one-tenth that of brass. When set into vertical vibrations with the sphere remaining inside the liquid all the time, the period will be-

(A) $\left[\frac{9}{10}\right]T$ (B) $T\sqrt{\left(\frac{10}{9}\right)}$ (C) Unchanged (D) $T\sqrt{\left(\frac{9}{10}\right)}$

28. A moving particle of mass has one-dimensional potential energy $U(x) = ax^2 + bx^4$, where 'a' and 'b' are positive constants. The angular frequency of small oscillations about the minima of the potential energy is equal to

(A) $\pi\sqrt{\frac{a}{2b}}$ (B) $2\sqrt{\frac{a}{m}}$ (C) $\sqrt{\frac{2a}{m}}$ (D) $\sqrt{\frac{a}{2m}}$

29. A particle performs S.H.M. of amplitude A with angular frequency w along a straight line. When it is at a distance $\frac{\sqrt{3}}{2}A$ from mean position, its kinetic energy gets increased by an amout $\frac{1}{2}m\omega^2A^2$ due to an impulsive force. Then its new amplitude becomes-

(A) $\frac{\sqrt{5}}{2}A$ (B) $\frac{\sqrt{3}}{2}A$ (C) $\sqrt{2}A$ (D) $\sqrt{5}A$

30. A particle executes SHM on a line 8 cm long. Its K.E. and P.E. will be equal when its distance from the mean position is :–

(A) 4 cm (B) 2 cm (C) $2\sqrt{2}$ cm (D) $\sqrt{2}$ cm

31. The total energy of a vibrating particle in SHM is E. If its amplitude and time period are doubled, its total energy will be :–

(A) 16E (B) 8E (C) 4E (D) E

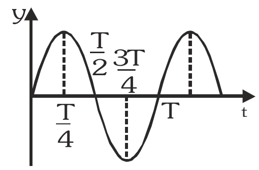
32. The distance between the point of suspension and the centre of gravity of a compound pendulum is ℓ and the radius of gyration about the horizontal axis through the centre of gravity is k, then its time period will be

(A) $2\pi\sqrt{\frac{\ell+k}{g}}$ (B) $2\pi\sqrt{\frac{\ell^2+k^2}{\ell g}}$ (C) $2\pi\sqrt{\frac{\ell+k^2}{g}}$ (D) $2\pi\sqrt{\frac{2k}{\ell g}}$

33. Displacement of a particle is $x = 3 \sin 2t + 4\cos 2t$, the amplitude and the maximum velocity will be :–

(A) 5, 10 (B) 3, 2 (C) 4, 2 (D) 3, 8

34. The graph shows the variation of displacement of a particle executing S.H.M. with time. We inference from this graph that :–



(A) the force is zero at time $\frac{3T}{4}$

(B) the velocity is maximum at time $\frac{T}{2}$

(C) the acceleration is maximum at time T

(D) the P.E. is equal to half of total energy at time $\frac{T}{2}$

35. The phase of a particle in SHM at time t is $\frac{13\pi}{6}$. The following inference is drawn from this

(A) the particle is at $x = \frac{a}{2}$ and moving in + X-direction

(B) the particle is at $x = \frac{a}{2}$ and moving in –X-direction

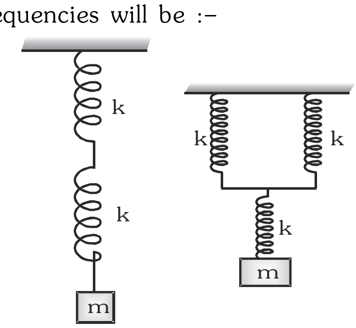
(C) the particle is at $x = -\frac{a}{2}$ and moving in + X-direction

(D) the particle is at $x = -\frac{a}{2}$ and moving in –X-direction

36. The time period of an oscillator is 8 sec. The phase difference from t = 2 sec to t = 4 sec will be :–

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) 2π

37. Some springs are combined in series and parallel arrangement as shown in the figure and a mass m is suspended from them. The ratio of their frequencies will be :–



(A) 1 : 1 (B) 2 : 1 (C) $\sqrt{3}$: 2 (D) 4 : 1

38. The acceleration due to gravity at height R above the surface of the earth is $\frac{g}{4}$. The periodic time of a simple pendulum in an artificial satellite at this height will be :–

(A) $T = 2\pi\sqrt{\frac{2l}{g}}$ (B) $T = 2\pi\sqrt{\frac{l}{2g}}$ (C) zero (D) infinity

39. The magnitude of average acceleration in half time period in a simple harmonic motion is

(A) $\frac{2A\omega^2}{\pi}$ (B) $\frac{A\omega^2}{2\pi}$ (C) $\frac{A\omega^2}{\sqrt{2\pi}}$ (D) zero

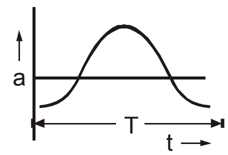
40. A particle performs S.H.M. with time period T. The time taken by the particle to move from half the amplitude to the maximum displacement is

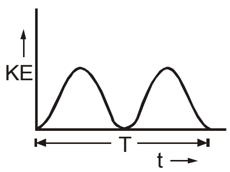
(A) $\frac{T}{2}$ (B) $\frac{T}{4}$ (C) $\frac{T}{6}$ (D) $\frac{T}{8}$

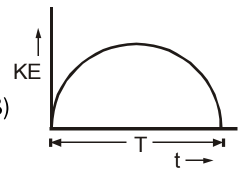
41. A particle of mass m executing SHM makes f oscillation per second. The difference of its kinetic energy when at the centre, and when at a distance x from the centre is

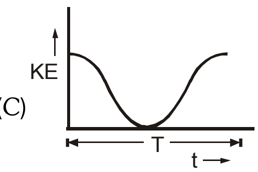
(A) $\pi^2 f^2 x^2 m$ (B) $2\pi^2 f^2 x^2 m$ (C) $\frac{1}{2}\pi^2 f^2 x^2 m$ (D) $f^2 x^2 m$

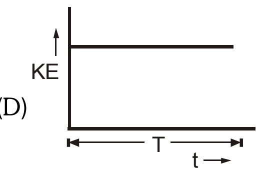
42. Acceleration a and time period T of a body in S.H.M. is given by a curve shown below. Then corresponding graph between kinetic energy KE and time t is correctly represented by



(A)


(B)


(C)


(D)


43. A particle is performing S.H.M. with acceleration $a = 8\pi^2 - 4\pi^2 x$ where x is coordinate of the particle w.r.t. the origin.The parameters are in S.I. units. The particle is at rest at $x = -2$ at $t=0$.
(A) coordinate of the particle w.r.t. origin at any time t is $2 - 4\cos 2\pi t$
(B) coordinate of the particle w.r.t. origin at any time t is $-2 + 4\sin 2\pi t$
(C) coordinate of the particle w.r.t. origin at any time t is $-4 + 2\cos 2\pi t$
(D) the coordinate cannot be found because mass of the particle is not given.

44. An oscillation is described by the equation $x = A\sin 2\pi\gamma_1 t$ where A changes with time according to the law $A = A_0(1+\cos 2\pi\gamma_2 t)$ where A_0 is constant. Find the ratio of frequencies of harmonic oscillations forming oscillation

(A) $\gamma_1 : \gamma_2 : (\gamma_1 - \gamma_2)$ (B) $\gamma_1 : (\gamma_1 - \gamma_2) : (\gamma_1 + \gamma_2)$ (C) $\gamma_1 : \gamma_2 : (\gamma_2 - \gamma_1)$ (D) $\gamma_1 : \gamma_2 : (\gamma_1 + \gamma_2)$

45. Vertical displacement of a plank with a body of mass 'm' on it is varying according to law $y = \sin\omega t + \sqrt{3}\cos\omega t$. The minimum value of ω for which the mass just breaks off the plank and the moment it occurs first after $t = 0$ are given by : (y is positive vertically upwards)

(A) $\sqrt{\frac{g}{2}}, \sqrt{\frac{2\pi}{6g}}$ (B) $\sqrt{\frac{g}{2}}, \frac{2\pi}{3\sqrt{g}}$ (C) $\sqrt{\frac{g}{2}}, \frac{\pi\sqrt{\pi}}{3\sqrt{g}}$ (D) $\sqrt{2g}, \sqrt{\frac{2\pi}{2g}}$

ANSWER KEY

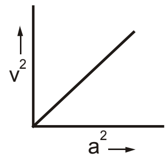
LEVEL-1

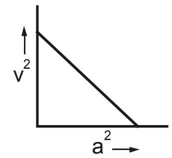
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	C	C	D	D	B	C	A	A	A	C	D	D	C	A	C	A	A	A	D
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	B	B	C	B	A	C	B	B	C	C	D	B	A	B	A	B	C	D	A	C
Que.	41	42	43	44	45															
Ans.	B	A	A	B	A															

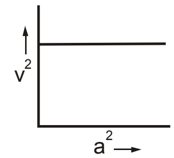
SIMPLE HARMONIC MOTION-LEVEL 2

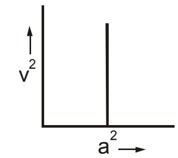
MCQs with one or more than one correct answer

1. A mass M is performing linear simple harmonic motion, then correct graph for acceleration 'a' and corresponding linear velocity 'v' is

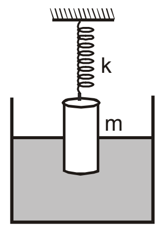
(A) 

(B) 

(C) 

(D) 

2. A uniform cylinder of mass m and length ℓ having area of cross-section a is suspended lengthwise with the help of a massless spring of constant k. The cylinder is half submerged in a liquid of density ρ. A small push and release makes it vibrate with small amplitude. The frequency of oscillation is



(A) $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ (B) $\frac{1}{2\pi}\sqrt{\frac{ka\rho g}{m}}$ (C) $\frac{1}{2\pi}\sqrt{\frac{m+a\rho g}{k}}$ (D) $\frac{1}{2\pi}\sqrt{\frac{k+a\rho g}{m}}$

3. Two identical springs are fixed at one end and masses 1kg and 4kg are suspended at their other ends . They are both stretched down from their mean position and let go simultaneously. If they are in the same phase after every 4 seconds then the springs constant k is

(A) $\pi\frac{N}{m}$ (B) $\pi^2\frac{N}{m}$ (C) $2\pi\frac{N}{m}$ (D) given data is insufficient

4. A cylindrical block of density ρ is partially immersed in a liquid of density 3ρ. The plane surface of the block remains parallel to the surface of the liquid. The height of the block is 60 cm. The block performs SHM when displaced from its mean position. [Use g = 9.8 m/s^2]

(A) the maximum amplitude is 20 cm. (B) the maximum amplitude is 40 cm
(C) the time period will be $2\pi/7$ seconds (D) none

5. A mass of 0.2kg is attached to the lower end of a massless spring of force-constant 200 N/m, the upper end of which is fixed to a rigid support. Which of the following statements is/are true?

(A) In equilibrium, the spring will be stretched by 1cm.
(B) If the mass is raised till the spring is unstretched state and then released, it will go down by 2cm before moving upwards.
(C) The frequency of oscillation will be nearly 5 Hz.
(D) If the system is taken to the moon, the frequency of oscillation will be the same as on the earth.

6. A horizontal plank has a rectangular block placed on it. The plank starts oscillating vertically and simple harmonically with an amplitude of 40 cm. The block just loses contact with the plank when the latter is at momentary rest. Then :

(A) the period of oscillation is $\left(\frac{2\pi}{5}\right)$

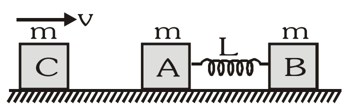
(B) the block weighs double of its weight, when the plank is at one of the positions of momentary rest

(C) the block weighs 0.5 times its weight on the plank halfway up
(D) the block weighs 1.5 times its weight on the plank halfway down

7. A particle is subjected to two simple harmonic motions along x and y directions according to, $x = 3\sin 100\pi t$; $y = 4\sin 100\pi t$.
(A) Motion of particle will be on ellipse traversing it in clockwise direction
(B) Motion of particle will be on a straight line with slope 4/3
(C) Motion will be simple harmonic motion with amplitude 5
(D) Phase difference between two motions is $\pi/2$

8. A particle moves in the x-y plane according to the equation, $\vec{r} = (\tilde{i} + 2\tilde{j})A\cos\omega t$. The motion of the particle is-
(A) on a straight line (B) on an ellipse (C) periodic (D) simple harmonic

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



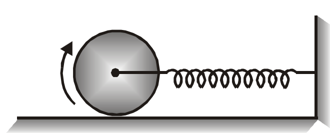
[A] The kinetic energy of the A-B system, at maximum compression of the spring, is zero.

[B] The kinetic energy of A-B system, at maximum compression of the spring is $\frac{mv^2}{4}$

[C] The maximum compression of the spring is $v\sqrt{\frac{m}{k}}$

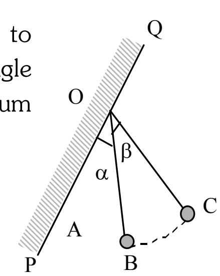
[D] The maximum compression of the spring is $v\sqrt{\frac{m}{2k}}$

10. A solid cylinder of mass M attached to a massless spring of force constant k is placed on a horizontal surface in such a way that cylinder can roll without slipping. If the system is released from the stretched position of the spring, then the period will be-



(A) $2\pi\sqrt{\frac{M}{k}}$ (B) $2\pi\sqrt{\frac{3M}{2k}}$ (C) $2\pi\sqrt{\frac{M}{2k}}$ (D) $2\pi\sqrt{\frac{2M}{3k}}$

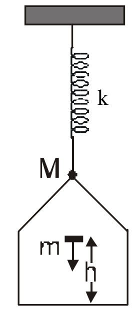
11. A ball is suspended by a thread of length L at the point O on the wall PQ which is inclined to the vertical through an angle α. The thread with the ball is now displaced through a small angle β away from the vertical and the wall. If $\beta < \alpha$, then the time period of oscillation of the pendulum will be-



(A) $2\pi\sqrt{\frac{L}{g}}$ (B) $2\pi\sqrt{\frac{L}{g}}\left[\pi + 2\sin^{-1}\left(\frac{\alpha}{\beta}\right)\right]$

(C) $2\pi\sqrt{\frac{L}{g}}\left[\frac{\pi}{2} + \sin^{-1}\left(\frac{\alpha}{\beta}\right)\right]$ (D) None of the above

12. A cage of mass M hangs from a light spring of force constant k. A body of mass m falls from height h inside the cage and sticks to its floor. The amplitude of oscillations of the cage will be-



(A) $\left(\frac{2mgh}{k}\right)^{1/2}$ (B) $\left(\frac{k}{2mgh}\right)^{1/2}$

(C) $\frac{mg}{k}$ (D) $\left(\frac{mg}{k}\right)^{1/2}$

13. In the above problem, the frequency of oscillations of the cage will be-

(A) $\frac{1}{2\pi}\left[\frac{k}{m}\right]^{1/2}$ (B) $\frac{1}{2\pi}\left[\frac{k}{M}\right]^{1/2}$ (C) $\frac{1}{2\pi}\left[\frac{k}{M+m}\right]^{1/2}$ (D) $\frac{1}{2\pi}\left[\frac{m}{k}\right]^{1/2}$

14. The amplitude of a particle executing SHM about O is 10 cm . Then :
(A) when the kinetic energy is 0.64 times of its max. kinetic energy its displacement is 6 cm from O
(B) when the displacement is 5 cm from O its kinetic energy is 0.75 times its maximum kinetic energy
(C) Its total energy of SHM at any point is equal to its maximum kinetic energy
(D) Its speed is half the maximum speed when its displacement is half the maximum displacement

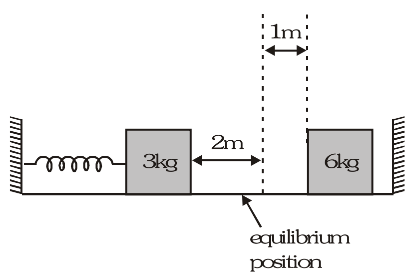
15. The angular frequency of a spring block system is ω_0. This system is suspended from the ceiling of an elevator moving downwards with a constant speed v_0. The block is at rest relative to the elevator. Lift is suddenly stopped. Assuming the downwards as a positive direction, choose the wrong statement :

(A) the amplitude of the block is $\frac{v_0}{\omega_0}$ (B) the initial phase of the block is π

(C) the equation of motion for the block is $\frac{v_0}{\omega_0}$ sin $\omega_0 t$ (D) the maximum speed of the block is v_0

16. The displacement of a particle varies according to the relation $x = 3 \sin 100t + 8 \cos^2 50t$. Which of the following is/are correct about this motion .
(A) the motion of the particle is not S.H.M.
(B) the amplitude of the S.H.M. of the particle is 5 units
(C) the amplitude of the resultant S.H. M. is $\sqrt{73}$ units
(D) the maximum displacement of the particle from the origin is 9 units .

17. Two blocks of masses 3 kg and 6 kg rest on a horizontal smooth surface. The 3 kg block is attached to a spring with a force constant $k = 900\ Nm^{-1}$ which is compressed 2 m from beyond the equilibrium position. The 6 kg block is at rest at 1 m from mean position. 3 kg mass strikes the 6 kg mass and the two stick together.



(A) velocity of the combined masses immediately after the collision is 10 ms^{-1}

(B) velocity of the combined masses immediately after the collision is 5 ms^{-1}

(C) amplitude of the resulting oscillation is $\sqrt{2}$ m

(D) amplitude of the resulting oscillation is $\sqrt{5}$ /2m.

18. A disc of mass 3 m and a disc of mass m are connected by massless spring of stiffness k. The heavier disc is placed on the ground with the spring vertical and lighter disc on top. From its equilibrium position, the upper disc is pushed down by a distance δ and released. Then

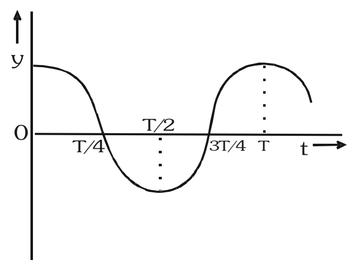
(A) if δ >3mg/k, the lower disc will bounce up

(B) if δ =2 mg/k, maximum normal reaction from ground on lower disc = 6 mg

(C) if δ =2 mg/k, maximum normal reaction from ground on lower disc = 4 mg

(D) if δ >4mg/k, the lower disc will bounce up

19. The displacement-time graph of a particle executing SHM is shown.



Which of the following statements is/are true?

(A) The velocity is maximum at t = T/2

(B) The acceleration is maximum at t = T

(C) The force is zero at t = 3T/4

(D) The potential energy equals the oscillation energy at t = T/2.

ANSWER KEY

LEVEL–2

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Ans.	B	D	B	AC	ABCD	ABCD	BC	CD	BD	B	A	A	C	ABC	B	BD	AC	BD	BCD