PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

SIMPLE HARMONIC MOTION

Objective Question

1. The phase of a particle executing simple harmonic motion is $\frac{\pi}{2}$ when it has

A. Maximum velocity

B. Maximum acceleration

C. Maximum energy

D. Maximum displacement

Answer: B::D

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2. A particle starts SHM 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

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

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

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

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

Answer: C

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3. The amplitude and the periodic time of a S.H.M. are 5 cm and 6 sec respectively. At a distance of 2.5 cm away from the mean position, the phase will be

A. $5\pi/12$

B. $\pi/4$

C. $\pi/3$

D. $\pi/6$

Answer: D

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4. Two equations of two S.H.M. are $y = \alpha \sin(\omega t - \alpha)$ and $y = b\cos(\omega t - \alpha)$. The phase difference between the two is

A. 0°

B. α°

C. 90°

D. 180°

Answer: C

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5. The amplitude and the time period in a S.H.M. is 0.5 cm and 0.4 sec respectively. If the initial phase is $\pi/2$ radian, then the equation of S.H.M. will be

A. $y = 0.5 \sin 5\pi t$

B. $y = 0.5 \sin 4\pi t$

C. $y = 0.5 \sin 2.5\pi t$

D. $y = 0.5 \cos 5\pi t$

Answer: D

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6. The equation of S.H.M. is $y = a\sin(2\pi nt + a)$, then its phase at time t is

A. $2\pi nt$

B. a

C. $2\pi nt + a$

D. $3\pi nt$

Answer: C

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7. A particle is oscillating according to the equation $X = 7\cos 0.5\pi t$, where t is in second. The point moves from the position of equilibrium to maximum displacement in time

A. 4.0 sec

B. 2.0 sec

C. 1.0 sec

D. 0.5 sec

Answer: C

8. A simple harmonic oscillation has an amplitude A and time period T. The time required to travel from $x = A$ to $x = \frac{A}{2}$ is

A. T / 6

B. T / 4

C. T / 3

D. T / 2

Answer: A

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9. Which of the following expressions does not represent simple harmonic motion

A. $x = A\sin(\omega t + \delta)$

B. $x = B\cos(\omega t + \phi)$

C. $x = A\tan(\omega t + \phi)$

D. $x = A\sin\omega t\cos\omega t$

Answer: D

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10. A 1.00×10^{-20}kg particle is vibrating with simple harmonic motion with a period of1.00×10^{-5} sec and a maximum speed of 1.00×10^{3} m/s . The maximum displacement of the particle is

A. 1.59 mm

B. 1.00 mm

C. 10 mm

D. none of these

Answer: A

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11. The phase (at a time t) of a particle in simple harmonic motion tells

A. Only the position of the particle at time t

B. Only the direction of motion of the particle at time t

C. Both the position and direction of motion of the particle at time t

D. Neither the position of the particle nor its direction of motion at time t

Answer: C

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12. A particle is moving with constant angular velocity along the circumference of a circle. Which of the following statements is true

A. The particle so moving executes S.H.M.

B. The projection of the particle on any one of the diameters executes S.H.M.

C. The projection of the particle on any of the diameters executes S.H.M.

D. None of the above

Answer: C

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13. A particle is executing simple harmonic motion with a period of T seconds and amplitude a metre . The shortest time it takes to reach a point $\frac{a}{\sqrt{2}}$ from its mean position in seconds is

A. T

B. T /4

C. T/8

D. T/16

Answer: C

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14. A simple harmonic motion is represented by $F(t) = 10\sin(20t + 0.5)$. The amplitude of the S.H.M. is

A. a = 30

B. a = 20

C. a = 10

D. a = 5

Answer: C

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15. Which of the following equation does not represent a simple harmonic motion

A. $y = a \sin \omega t$

B. $y = a \cos \omega t$

C. $y = a \sin \omega t + b \cos \omega t$

D. $y = a \tan \omega t$

Answer: D

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16. A particle is SHM is discribed by the displacement function $x(t) = a\cos(\omega t + \theta)$ 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. 1 cm

B. $\sqrt{2}$

C. 2 cm

D. 2.5 cm

Answer: B

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17. A particle executes a simple harmonic motion of time period T. Find the time taken by the particle to go directly from its mean position to half the amplitude.

A. T/2

B. T/4

C. T/8

D. T/12

Answer: D

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

A. A

B. B

C. A+B

D. $\sqrt{A} + B$

Answer: A

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19. A particle excuting $S.H.M.$ of amplitude $4cm$ and $T=4$ sec .The time take by it to move position extreme position to half the amplitude is

A. 1 sec

B. 1/3 sec

C. 2/3 sec

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

Answer: C

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20. Which one of the following is an oscillatory motion.

A. Vibration of a string on a guitar.

B. Earth spinning about its own axis

C. Earth rotating around the sun.

D. Particle moving in a circle with uniform speed

Answer: A

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

A. Periodic and oscillatory

B. Periodic but not oscillatory

C. A periodic

D. None of the above

Answer: B

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22. Two simple harmonic are represented by the equation

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

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

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

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

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

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

Answer: C

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23. Two particles are executing S.H.M. The equation of their motion are $y_1 = 10\sin\left(\omega t + \frac{\pi T}{4}\right)$, $y_2 = 25\sin\left(\omega t + \left(\sqrt{3}\pi\frac{T}{4}\right)\right)$. What is the ratio of their amplitude

A. $1:1$

B. $2:5$

C. $1:2$

D. None of these

Answer: B

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24. The periodic time of a body executing simple harmonic motion is 3 sec. After how much time from time $t = 0$, its displacement will be half of its amplitude

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

B. $\frac{1}{6}$sec

C. $\frac{1}{4}$sec

D. $\frac{1}{3}$sec

Answer: C

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25. A system exhibiting S.H.M. must possess

A. Inertia only

B. Elasticity as well as inertia

C. Elasticity, inertia and an external force

D. Elasticity only

Answer: B

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26. If $x = a\sin\left(\omega t + \frac{\pi}{6}\right)$ and $x = a\cos\omega t,$ then what is the phase difference between the two waves?

A. $\pi/3$

B. $\pi/6$

C. $\pi/2$

D. π

Answer: A

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27. Two particles execute SHM of same amplitude and frequency on parallel lines. They pass one another when moving in opposite directions each time their displacement is one third their amplitude. What is the phase difference between them?

A. 30°

B. 60°

C. 90°

D. 120°

Answer: D

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28. The displacement of a particle 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. $144\omega^2$

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

Answer: B

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29. A linear harmonic oscillator of force constant $2 \times 10^6 N/m$ and amplitude (0.01 m) has a total mechanical energy of (160 J). Its.

A. Maximum potential energy is 100 J

B. Maximum K.E. is 100 J

C. Maximum P.E. is 160 J

D. Minimum P.E. is zero

Answer: B::C

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30. 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. inderpendent of a

C. proportional to $\sqrt{a}$

D. proportional to $a^{3/12}$

Answer: A

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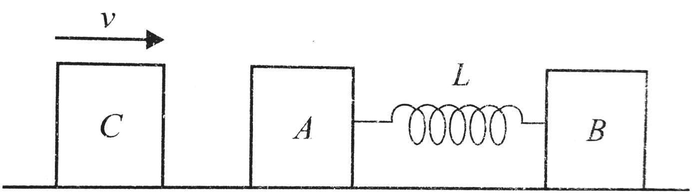
31. Two blocks A and H. each of mass m, are connected by a massless spring of natural length I.

and spring constant K. The blocks are initially resting in a smooth horizontal floor with the spring at its natural length, as shown in Fig. A third identical block C, also of mass m, moves on the floor with a speed v along the line joining A and B. and collides 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 the A - B system at maximum compression of the spring is $mv^2/4$

C. the maximum compression of the spring is

$c\sqrt{m / K}$

D. the maxium compression of the spring ia

$v\sqrt{m / 2K}$

Answer: B::D

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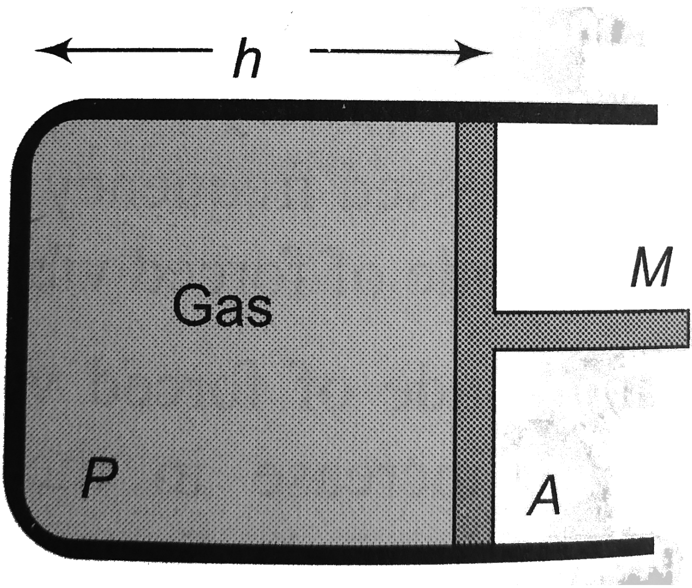
32. A cylinder piston of mass M sides smoothlly inside a long cylinder closed at and enclesing a cartin mass of gas The cylinder is kept with its axis horizantal if the pistan is distanced from its equations positions it oscillation simple

harmoniically .THe period of oscillation will be



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

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

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

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

Answer: A

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33. A sphere of radius r is kept on a concave mirror of radius of curation R. The arrangement is kept on a horizontal surface (the surface of concave mirror is friction less 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. $2\pi\sqrt{\left(\frac{(R-r)1.4}{g}\right)}$

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

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

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

Answer: B

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34. The amplitude of vibration of a particle is given by $a_m = (a_0) / (a\omega^2 - b\omega + c)$, where a_0, a, b and c are positive. The condition for a single resonant frequency is

A. $b^2 = 4ac$

B. $b^2 > 4ac$

C. $b^2 = 5ac$

D. $b^2 = 7ac$

Answer: A

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35. 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: B

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36. A particle is performing simple harmonic motion along $x -$ axis with amplitude $4cm$ and time period $1.2\sec$ .The minimum time taken by the particle to move from $x = 2cm \rightarrow x = +4cm$ and back again is given by

A. 0.6 sec

B. 0.4 sec

C. 0.3 sec

D. 0.2 sec

Answer: D

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37. A large horizontal surface moves up and down in SHM with an amplitude of 1 cm . If a mass of 10 kg (which is placed on the surface) is to remain continually in contact with it, the maximum frequency of S.H.M. will be

A. 0.5 Hz

B. 1.5 Hz

C. 5 Hz

D. 10 Hz

Answer: C

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

A. 0.72 sec

B. 0.64 sec

C. 0.48 sec

D. 0.36 sec

Answer: C

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39. A horizontal platform with an object placed on it is executing S.H.M. in the vertical direction. The amplitude of oscillation is 3.92×10^{-3} m. what must ve the least period of these oscillations. So that the object is not detached from the platform

A. 0.1256 sec

B. 0.1356 sec

C. 0.1456 sec

D. 0.1556 sec

Answer: A

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40. A particle executes simple harmonic motion between $x = -A$ and $x = +A$. The time taken for it to go from $0 \rightarrow A/2 is T_1$ and $\rightarrow goomA/2 \rightarrow (A) is (T_2)$. 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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41. A simple pendulum of length L and mass (bob) M is oscillating in a plane about a vertical line between angular limits $-\phi$ and $+\phi$ For an angular displacement $\theta(|\theta| < \phi)$. the tension in the string and the velocity of the bob are T and v respectively. The following relations hold good under the above conditions

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

$$T\cos\theta = Mg$$

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

$$T = Mg\cos\theta$$

A. $T cod\theta = Mg$

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

C. the magtiude of the tangenital acceleration of the bob $|a_T| g\sin\theta$

D. $T = Mg\cos\theta$

Answer: B::C

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42. Two simple pendulums of length $0.5m$ and $0.2m$ respectively are given small linear displacement in one direction at the same time. They will again be in the same phase when the pendulum of shorter length has completed oscillations

A. 5

B. 1

C. 2

D. 3

Answer: C

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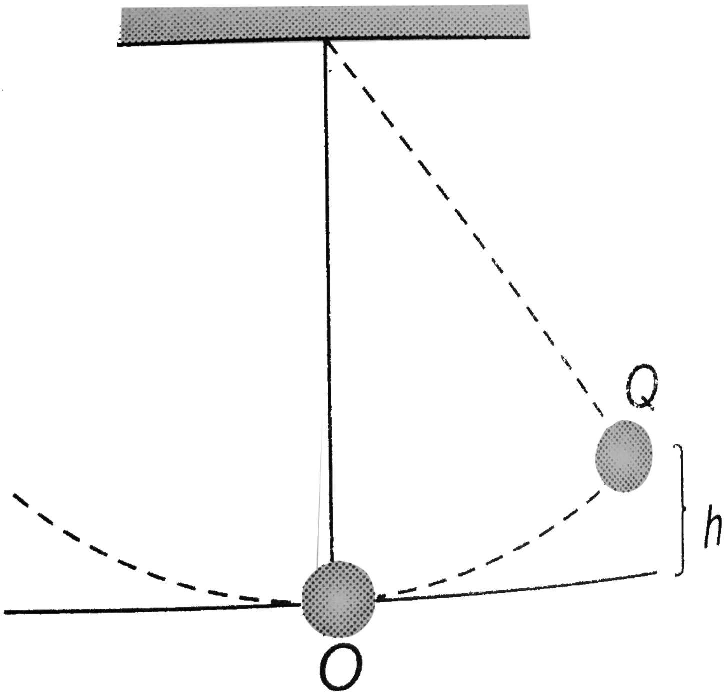
43. The bob of a simple pendulum it displaced position O to a equilibrium position Q which is at height h above O and the bob to then mass released

Assuming the mass of the bob is m and time period

2.0 sec of oscillation to be string when the bob

passes through O is



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

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

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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44. The matallic bob of a simple pendulum has the relative density ρ. The time period of this pendulum is T it the metallic bob is immersed in water 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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45. A clock with an iron pendulum keeps correct time at $20^{\circ}C$. How much time will it lose or gain in a day if the temperature changes to $40^{\circ}C$. Thermal coefficient of liner expansion $\alpha = 0.000012 per ^{\circ}C$.

A. 10.3 second/ day

B. 20.6 seconds / days

C. 5 seconds/ day

D. 20 minutes /day

Answer: A

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46. 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 (prop), is given by.

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

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

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

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

Answer: A

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47. 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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48. A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then the long piece will have a force constant of

A. (2/3)k

B. (3 / 2)k

C. 3k

D. 6k

Answer: B

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49. 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. $2\pi\left\{\frac{(YA+KL)m}{YAK}\right\}^{1/2}$

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

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

Answer: B

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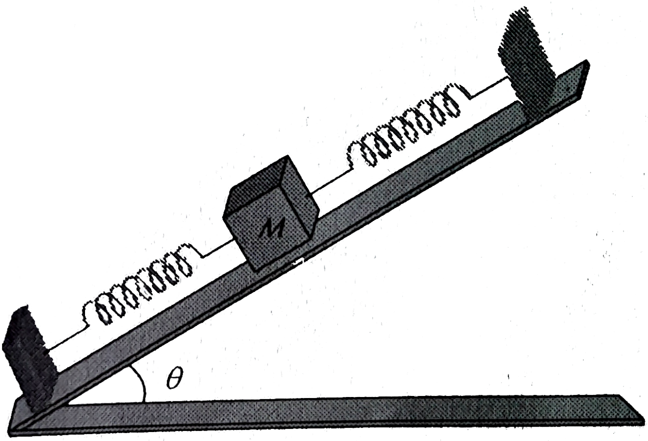
50. On a smooth inclined plane, a body of mass M is attached between two springs. The other ends of the springs are fixed to firm supports. If each spring has force constant K , the period of oscillation of the body (assuming the springs as massless) is



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

B. $2\pi\left(\frac{2M}{K}\right)^{1/2}$

C. $2\pi \frac{Mg\sin\theta}{2K}$

D. $2\pi\left(\frac{2Mg}{K}\right)^{1/2}$

Answer: A

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

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

Answer: B

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52. A $15gm$ ball is shot from a spring whose spring has a force constant of $600N/m$. The spring is compressed by $5cm$. The greater possible horizontal range of the ball for this compression is

A. 6.0 m

B. 10.0 m

C. 12.0 m

D. 8.0 m

Answer: B

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53. An ideal spring with spring constant k is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. Then the maximum extension in the spring is

A. 4 Mg/ K

B. 2 Mg/ k

C. Mg/ K

D. Mg/ 2K

Answer: B

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54. 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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55. Three simle harmionic motions in the same direction having the same amplitude (a) and same period are superposed. If each differs in phase from the next by 45°, then.

A. the resultant amplitude is $(l + \sqrt{2}a)$

B. The energy of the resultant motion relatine to the first is 90°

C. The energy associated with the resulting motion is $(3 + 2\sqrt{2})$ times the energy associed with any single motion

D. the resulting motion is not simple harmonic

Answer: A::C

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56. the funcation $\sin^2(\omega t)$ repesents

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

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

C. A periodic buy not simple harmoic 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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57. A simple pendulum has time period T_1. When the point of suspension moves vertically up according to the equation $y = kt^2$ where $k = 1m / s^2$ and $'t'$ is time then the time period of the pendulum is T_2 then $(T_1 / T_2)^2$ is

A. $2 / 3$

B. $5 / 6$

C. $6 / 5$

D. $3/2$

Answer: C

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58. A simple pendulum is hanging from a peg inserted in a vertical wall. Its bob is stretched in horizontal position from the wall and is left free to move. The bob hits on the wall the coefficient of restitution After how many collsions the amplitude of vibration will become less than 60°

A. 6

B. 3

C. 5

D. 4

Answer: B

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59. A brass cube of side a and density $\sigma$is floating in mercury of density ρ. If the cube is displaced a bit vertically, it executes S.H.M. Its time period will be

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

Answer: A

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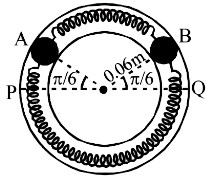
60. Two identical balls (A) and (B) each of mass (0.1 kg), are attached to two identical massless springs. The spring - mass system is constrained to move inside a riged smooth pipe bant in the form of a circle as shown in Fig. The pipe is fixed in a horizontal plane.

The centres of the balls can move in a circle of radius

(0.06 pi) meter. Each spring has a natural length $zof0.06\pi$ meter and spring spring constant5 $0.1N/m$. Initially, both the balls are displaced by an angle $\theta = \pi/6$ radian with respect to the diameter (pQ) of the circle (as shown in Fig.) and released from, rest.



(i) Calculate the frequency of oscillation of ball (B).

(ii) Find the speed of ball (A) when (A) and (B) are at the two ends of the diameter (PQ).

(iii) What is the total energy of the system.

A. πHz

B. $1/\pi Hz$

C. $2\pi Hz$

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

Answer: B

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61. A disc of radius R and mass M is pivoted at the rim and it set for small oscillations. If simple pendulum has to have the same period as that of the disc, the length of the simple pendulum should be

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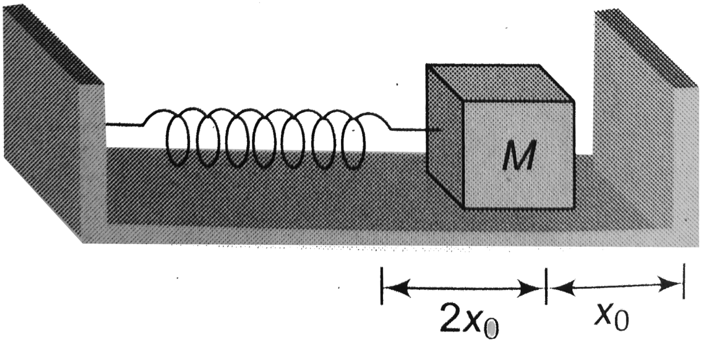
62. One end of a spring of force constant k is fixed to a vertical wall and the other to a block of mass m resting on a smooth horizontal surface There is another and wall at a distance x_0 from the block The spring is then compressed by $2x_0$ and released The time taken to strike the wall is



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

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

C. $\frac{2\pi}{6}\sqrt{\frac{m}{k}}$

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

Answer: C

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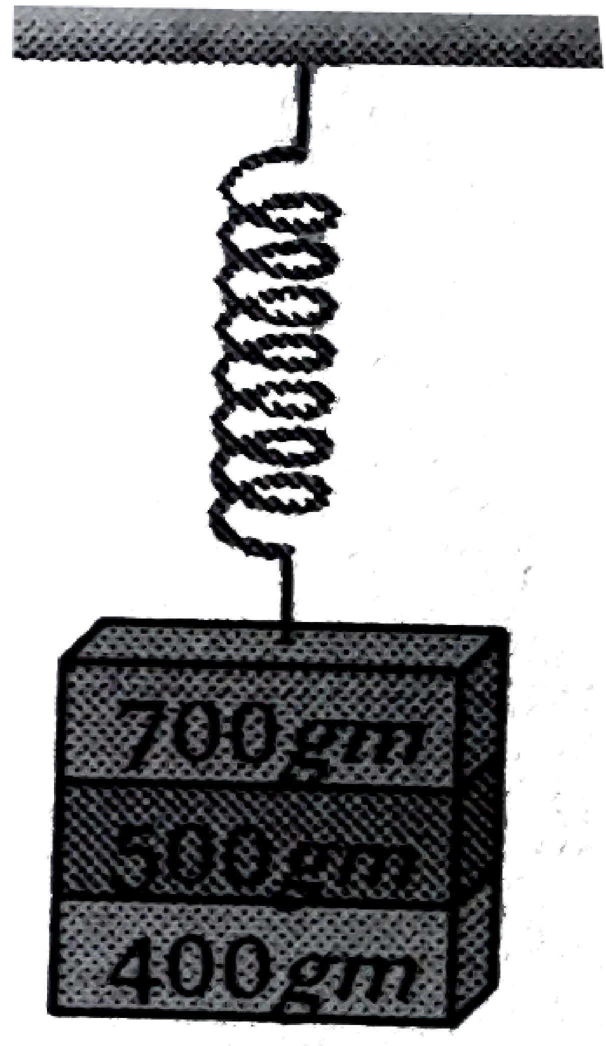
63. Three masses 700 g , 500 g , and 400 g are suspended at the end of a spring a shown and are in equilibrium. When the 700 g mass is removed, the system oscillates with a period of 3 seconds, when the 500 gm mass also removed. It will oscillate with a



period of

A. 1s

B. 2 s

C. 3 s

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

Answer: B

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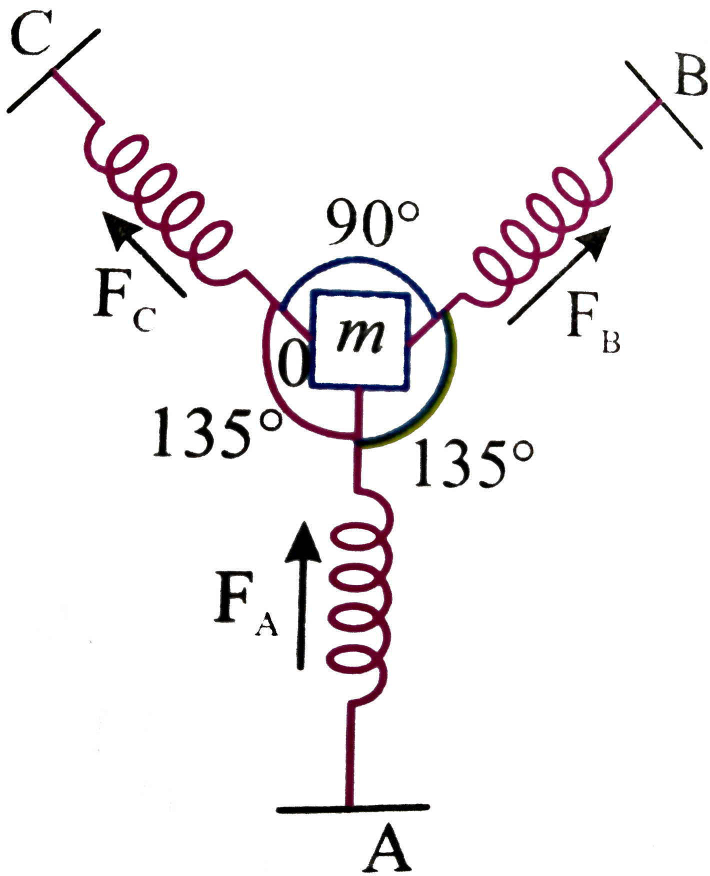
64. A particle of mass 'm' is attached to three identical springs A, B and C each of force constant 'K' as shown in figure. If the particle of mass 'm' is pushed slightly against the spring 'A' and released the period of oscillations is



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

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

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

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

Answer: B

Watch Video Solution

65. A metallic sphere is filled with water and hung by a long thread. It is made to oscillate. If there is a small hole in the bottom through which water slowly flows out, the time period will

A. Continuously decrease

B. Continuously increase

C. First decrease and then increase to original value

D. First increase and then decrease to original value

Answer: D

Watch Video Solution

66. Two simple pandulum whose lengths are $100 cm$ and $121 cm$ are suspended side by side. Then bobs are pulled together and then released. After how many minimum oscillations of the longer pendulum will two be in phase again. ?

A. 11

B. 10

C. 21

D. 20

Answer: B

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67. The amplitude of damped oscillator becomes half in one minute. The amplitude after 3 minutes will be

$1/x$ times the original, where x is

A. 2x 3

B. 2^3

C. 3^2

D. 3×2^2

Answer: B

Watch Video Solution

68. 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. Which of the following function represents a simple harmonic oscillation

Answer: A

Watch Video Solution

69. A uniform rod of length 2.0 m is suspended through an end and is set into oscillation with small amplitude under gravity. The time period of oscillation is approximately

A. 1.60sec

B. 1.80 sec

C. 2.0 sec

D. 2.40 sec

Answer: D

Watch Video Solution

Velocity Of Simple Harmonic Motion

1. A simple pendulum 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. $\frac{\pi A\sqrt{3}}{T}$

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

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

D. $\frac{3\pi^2 A}{T}$

Answer: A

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2. A body is executing simple harmonic motion with an angular frequency s rad/2 . The velocity of the body at 20 mm displacement, when the amplitude of motion is 60 mm , is

A. 40 mm /s

B. 60mm/s

C. 113 mm/s

D. 120 mm/s

Answer: C

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3. 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

A. 5 cm

B. $5\sqrt{2}$ cm

C. $5\sqrt{3}$ cm

D. $10\sqrt{2}$ cm

Answer: C

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4. A simple harmonic oscillator has a period of 0.01 sec and an amplitude of 0.2 m . The magnitude of the velocity in $m \sec^{-1}$ at the centre of oscillation is

A. 20π

B. 100

C. 40π

D. 100π

Answer: C

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5. A particle executes S.H.M. with a period of 6 second and amplitude of 3 cm . Its maximum speed in cm / sec is

A. $\pi / 2$

B. π

C. 2π

D. 3π

Answer: B

Watch Video Solution

6. particle is executing S.H.M. If its amplitude is 2 m and periodic time 2 seconds , then the maximum velocity of the particle will be

A. $\pi m / s$

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

C. $2\pi m / s$

D. $4\pi m / s$

Answer: C

Watch Video Solution

7. A SHM has amplitude A and time period T. The maximum velocity will be

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

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

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

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

Answer: D

Watch Video Solution

8. A body is executing S.H.M. when its displacement from the mean position is 4 cm and 5 cm, the corresponding velocity of the body is 10 cm/sec and 8 cm/sec. Then the time period of the body is

A. $2\pi \sec$

B. $\pi / 2 \sec$

C. $\pi \sec$

D. $3\pi / 2 \sec$

Answer: C

Watch Video Solution

9. A partilce is executive simple harmonic motion given by

$$x = 5\sin\left(4t - \frac{\pi}{6}\right)$$

The velocity of the particle when its displacement is 3 units is

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

B. $5\frac{\pi}{6}$

C. 20

D. 16

Answer: D

Watch Video Solution

10. If a simple pendulum oscillates with an amplitude of 50 mm and time period of 2 sec, then its maximum velocity is

A. 0.10 m / s

B. 0.15 m/s

C. 0.8 m/s

D. 0.26 m/s

Answer: B

Watch Video Solution

11. If the displacement of a particle executing SHM is given by $y = 0.30 \sin(220t + 0.64)$ in metre , then the frequency and maximum velocity of the particle is

A. 35 Hz , 66 m / s

B. 45 Hz , 66 m / s

C. 58 Hz , 113 m / s

D. 35 Hz, 132 m/s

Answer: A

Watch Video Solution

12. The maximum velocity and the maximum acceleration of a body moving in a simple harmonic oscillator are 2 m/s and $4m/s^2$. Then angular velocity will be

A. 3 rad/sec

B. 0.5 rad/sec

C. 1 rad/sec

D. rad/se

Answer: D

Watch Video Solution

13. If a particle under S.H.M. has time period 0.1 sec and amplitude 2×10^{-3} It has maximum velocity

A. $\frac{\pi}{25} m / s$

B. $\frac{\pi}{26} m / s$

C. $\frac{\pi}{30} m / s$

D. None of these

Answer: A

Watch Video Solution

14. A particle executing simple harmonic motion has an amplitude of 6 cm . Its acceleration at a distance of 2 cm from the mean position is $8c\frac{m}{s^2}$ The maximum speed of the particle is

A. 8 cm/s

B. 12 cm /s

C. 16 cm/s

D. 24 cm/s

Answer: B

Watch Video Solution

15. A particle executes simple harmonic motion with an amplitude of 4 cm . At the mean position the velocity of the particle is 10 cm/ s . The distance of the particle from the mean position when its speed becomes 5 cm/s is

A. $\sqrt{3}cm$

B. $\sqrt{5}cm$

C. $2\sqrt{3}cm$

D. $2\sqrt{5}cm$

Answer: C

Watch Video Solution

16. Two particles P and Q start from origin and execute simple harmonic motion along X-axis with same amplitude but with periods $3s$ and $6s$ respectively. The ratio of the velocities of P and Q when they meet is

A. $1:2$

B. $2:1$

C. $2:3$

D. $3:2$

Answer: B

Watch Video Solution

17. A particle is performing simple harmonic motion with amplitude A and angular velocity ω . The ratio of maximum velocity to maximum acceleration is

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

B. $1/\omega$

C. ω

D. $A\omega$

Answer: B

Watch Video Solution

18. The angular velocities of three bodies in SHM are $\omega_1, \omega_2, \omega_3$ with their respective amplitudes as A_1, A_2, A_3. If all three bodies have same mass and maximum velocity then

A. $A_1\omega_1 = A_2\omega_2 = A_3\omega_3$

B. $A_1\omega_1^2 = A_2\omega_2^2 = A_3\omega_3^2$

C. $A_1^2\omega_1 = A_2^2\omega_2 = A_3^2\omega_3$

D. $A_1^2\omega_1^2 = A_2^2\omega_2^2 = A^2$

Answer: A

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19. The velocity of a particle performing simple harmonic motion, when it passes through its mean position i

A. Infinity

B. Zero

C. Minimum

D. Maximum

Answer: D

Watch Video Solution

20. The velocity of a particle in simple harmonic motion at displacement y from mean position is

A. $\omega\sqrt{a^2 + y^2}$

B. $\omega\sqrt{a^2 - y^2}$

C. ωy

D. $\omega^2\sqrt{a^2 - y^2}$

Answer: B

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21. particle is executing the motion $x = A\cos(\omega t - \theta)$ The maximum velocity of the particle is

A. A $\omega \cos \theta$

B. $A\omega$

C. $A\omega \sin \theta$

D. none of these

Answer: B

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22. A particle executing simple harmonic motion with amplitude of 0.1 m. At a certain instant when its displacement is 0.02 m, its acceleration is 0.5 m/s 2. The maximum velocity of the particle is (in m/s)

A. 0.01

B. 0.05

C. 0.5

D. 0.25

Answer: C

Watch Video Solution

23. 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. 1 cm

D. 2 cm

Answer: D

Watch Video Solution

24. The maximum velocity of a simple harmonic motion represented by $y = 3\sin\left(100t + \frac{\pi}{6}\right)$ is given by

A. 300

B. $\frac{3\pi}{6}$

C. 100

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

Answer: A

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25. The amplitude and maximum velocity will be respectively $X = 3\sin 2t + 4\cos 2t$The amplitude and maximum velocity will be respectively

A. 5,10

B. 3,2

C. 4,2

D. 3,4

Answer: A

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26. Velocity at mean position of a particle executing S.H.M. is v , they velocity of the particle at a distance equal to half of the amplitude

A. 4 v

B. 2 v

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

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

Answer: C

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27. The instantaneous displacement of a simple pendulum oscillator is given by $x = A\cos\left(\omega t + \frac{\pi}{4}\right)$

Its speed will be maximum at time

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

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

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

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

Answer: A

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Acceleration Of Simple Harmonic Motion

1. Which of the following is a necessary and sufficient condition for S.H.M.

A. Constant period

B. Constant acceleration

C. Proportionality between acceleration and displacement from equilibrium positio

D. Proportionality between restoring force and displacement from equilibrium position

Answer: D

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2. If a hole is bored along the diameter of the earth and a stone is dropped into hole

A. The stone reaches the centre of the earth and stops there

B. The stone reaches the other side of the earth and stops there

C. The stone executes simple harmonic motion about the centre of the eart

D. The stone reaches the other side of the earth and escapes into space

Answer: C

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3. The acceleration of a particle in S.H.M. is

A. Always zero

B. Always constant

C. Maximum at the extreme position

D. Maximum at the equilibrium position

Answer: C

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4. The displacement of a particle moving in S.H.M. at any instant is given by $y = a \sin \omega t$. The accelreation after time $t = \frac{T}{4}$ os

A. $a\omega$

B. $-a\omega$

C. $a\omega^2$

D. $-a\omega^2$

Answer: C

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5. The amplitude of a particle executing S.H.M. with frequency of 60 Hz is 0.01 m . The maximum value of the acceleration of the particle is

A. $144\pi^2 m / \sec^2$

B. $144 m / \sec^2$

C. $\frac{144}{\pi^2} m / \sec^2$

D. $288\pi^2 m / \sec^2$

Answer: B

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6. A small body of mass 0.10 kg is executing S.H.M. of amplitude 1.0 m and period 0.20 sec . The maximum force acting on it i

A. 98. 596 N

B. 985.86 N

C. 100. 2 N

D. 76.23 N

Answer: A

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7. A body executing simple harmonic motion has a maximum acceleration equal to $24 metres / \sec^2$ metres and maximum velocity equal to 16 metres/ sec . The amplitude of the simple harmonic motion is

A. $\frac{32}{3}$ metres

B. $\frac{3}{32}$ metres

C. $\frac{1024}{9}$ metres

D. $\frac{64}{9}$ metres

Answer: A

Watch Video Solution

8. For a particle executing simple harmonic motion, which of the following statements is not correct

A. The total energy of the particle always remains the same

B. The restoring force of always directed towards a fixed point

C. The restoring force is maximum at the extreme positions

D. The acceleration of the particle is maximum at the equilibrium position

Answer: D

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9. A particle of mass 10grams is executing simple harmonic motion with an amplitude of 0.5 m and periodic time of)$(\pi / 5)$seconds . The maximum value of the force acting on the particle

A. 25 N

B. 5 N

C. 2.5 N

D. 0.5 N

Answer: D

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10. The displacement of an oscillating particle varies with time (in seconds) according to the equation $y = (cm) = \sin\left(\frac{\pi}{2}\right)\left(\frac{t}{2} + \frac{1}{3}\right)$ The maximum acceleration of the particle is approximately

A. $5.21 cm / s^2$

B. $3.62 cm / s^2$

C. $1.81cm / s^2$

D. $0.62cm / s^2$

Answer: D

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11. A particle moving along the X-axis executes simple harmonic motion, then the force acting on it is given by

where, A and K are positive constants.

A. $-AKx$

B. $A\cos(Kx)$

C. $A \exp(-x)$

D. A Kx

Answer: A

Watch Video Solution

12. A body is vibrating in simple harmonic motion with an amplitude of 0.06 m and frequency of 15 Hz . The velocity and acceleration of body is

A. $5.65 m/s$ and $5.32 \times 10^2 m/s^2$

B. $6.82 m/s$ and $7.62 \times 10^2 m/s^2$

C. $8.91 m/s$ and $8.21 \times 10^2 m/s^2$

D. $9.82m/s$ and $9.03 \times 10^2 m/s^2$

Answer: A

Watch Video Solution

13. A particle executes simple harmonic motion with an angular velocity and maximum acceleration of $3.5rad/\sec$ and $7.5m/s^2$ respectively. The amplitude of oscillation

A. 0.28 m

B. 0.36 m

C. 0.53 m

D. 0.61 m

Answer: D

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14. A 0.10 kg block oscillates back and forth along a horizontal surface. Its displacement from the origin is given by: $x = (10cm)\cos[(10rads)t + \pi / 2rad]$ what is the maximum acceleration experiences by the block

A. $10m / s^2$

B. $10\pi m / s^2$

C. $\frac{10\pi}{2} m / s^2$

D. $\frac{10\pi}{3} m / s^2$

Answer: A

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15. In S.H.M. maximum acceleration is a

A. Amplitude

B. Equilibrium

C. Acceleration is constant

D. None of these

Answer: A

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16. A particle is executing simple harmonic motion with an amplitude of 0.02 metre and frequency 50 Hz . The maximum acceleration of the particle is

A. $100m/s^2$

B. $100\pi^2 m/s^2$

C. $100m/s^2$

D. $200\pi^2 m/s^2$

Answer: D

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17. Acceleration of a particle, executing SHM, at it's mean position is

A. Infinity

B. Varies

C. Maximum

D. Zero

Answer: D

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18. 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 maxium , a is maxium

B. value if a is zero , whatever may be the value of v

C. whaen v is zero , a is zero

D. when v is maxium , a is zero

Answer: D

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19. What is the maximum acceleration of the particle doing the SHM $\gamma = 2\sin\left[\frac{\pi t}{2}\phi\right]$ where gamma is in cm?

A. $\frac{\pi}{2} cm / s^2$

B. $\frac{\pi^2}{2} cm / s^2$

C. $\frac{\pi}{4} cm / s^2$

D. $\frac{\pi}{4} cm / s^2$

Answer: B

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20. A particle executes linear simple harmonic motion with an amplitude of 2 cm . When the particle is at 1 cm from the mean position the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is

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

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

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

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

Answer: C

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21. In simple harmonic motion, the ratio of acceleration of the particle to its displacement at any time is a measure of

A. Spring constant

B. Angular displacement

C. Angular frequency

D. Restoring force

Answer: C

Watch Video Solution

Energy Of Simple Harmonic Motion

1. The total energy of a particle executing S.H.M. is proportional to

A. Displacement from equilibrium position

B. Frequency of oscillation

C. Velocity in equilibrium position

D. Square of amplitude of motion

Answer: D

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2. A particle executes simple harmonic motion along a straight line with an amplitude A . The potential energy is maximum when the displacement is

A. $\pm A$

B. zero

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

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

Answer: A

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3. A particle is vibrating in a simple harmonic motion with an amplitude of 4 cm . At what displacement from the equilibrium position, is its energy half potential and half kinetic

A. 1 cm

B. $\sqrt{2}cm$

C. 3 cm

D. $2\sqrt{2}cm$

Answer: D

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4. 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_o

B. zero

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

D. not obtaninable

Answer: A

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5. The potential energy of a particle with displacement X is $U(X)$. The motion is simple harmonic, when (K is a positive constant)

A. $U = -\frac{KX^2}{2}$

B. $U = KX^2$

C. $U = K$

D. $U = KX$

Answer: A

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6. The kinetic energy and potential energy of a particle executing simple harmonic motion will be equal, when displacement (amplitude $= a$) is

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

B. $a\sqrt{2}$

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

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

Answer: C

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7. The total energy of the body excuting $S.\,H.\,M.$ is E . Then the kinetic energy when the displacement is half of the amplitude, is

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

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

C. $2\,\frac{E}{4}$

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

Answer: C

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8. The potential energy of a particle executing S.H.M. is 2.5 J, when its displacement is half of amplitude. The total energy of the particle will be

A. 18 J

B. 10 J

C. 12 J

D. 2.5 J

Answer: B

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9. The angular velocity and amplitude of simple pendulum are ω and r respectively. At a displacement x from the mean position, if its kinetic energy is T and potential energy is U, find the ratio of T to U.

A. $x^2\omega^2 / (a^2 - x^2\omega^2)$

B. $x^2 / (a^2 - x^2\omega^2)$

C. $(a^2 - x^2\omega^2) / x^2\omega^2$

D. $(a^2 - x^2) / x^2$

Answer: D

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10. When the potential energy of a particle executing simple harmonic motion is one-fourth of its maximum value during the oscillation, the displacement of the particle from the equilibrium position in terms of its amplitude a is

A. a/4

B. a/3

C. a/2

D. 2a/3

Answer: C

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11. A particle of mass 10 gm is describing S.H.M. along a straight line with period of 2 sec and amplitude of 10 cm . Its kinetic energy when it is at 5 cm from its equilibrium position is

A. $37.5\pi^2$ ergs

B. $3.75\pi^2$ ergs

C. $375\pi^2$ ergs

D. $0.375\pi^2$ ergs

Answer: C

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12. When the displacement is half the amplitude, the ratio of potential energy to the total energy is

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

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

C. 1

D. $\frac{1}{8}$

Answer: B

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

A. $\frac{1}{2} m \omega^2 x^2$

B. $\frac{1}{2} m \omega^2 a^2$

C. $\frac{1}{2} m \omega^2 \left(a^2 - x^2\right)$

D. zero

Answer: A

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14. A vertical mass-spring system executed simple harmonic oscillation with a period $2s$ quantity of this system which exhibits simple harmonic motion with a period of $1\,\text{sec}$ are

A. Velocity

B. Potential energy

C. Phase difference between acceleration and displacemen

D. Difference between kinetic energy and potential energy

Answer: A

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15. For any S.H.M., amplitude is 6 cm . If instantaneous potential energy is half the total energy then distance of particle from its mean position is

A. 3 cm

B. 4.2 cm

C. 5.8 cm

D. 6 cm

Answer: B

Watch Video Solution

16. A body of mass 1kg is executing simple harmonic motion. Its displacement y(cm) at t seconds is given by $y = 6\sin(100t + \pi/4)$. Its maximum kinetic energy is

A. 6 j

B. 18 j

C. 24 j

D. 36 j

Answer: B

Watch Video Solution

17. A particle is executing simple harmonic motion with frequency f . The frequency at which its kinetic energy changes into potential energy is

A. f/2

B. f

C. 2 f

D. 4 f

Answer: C

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18. There is a body having mass m and performing SHM amplitude a There is a restoring force $F = -Kx$ 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,x

Answer: B

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19. The total energy of a particle executing S.H.M. is 80 J . What is the potential energy when the particle is at a distance of 3/4 of amplitude from the mean position

A. 60 j

B. 10 j

C. 40 j

D. 45 j

Answer: D

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20. In a simple harmonic oscillator, at the mean position

A. Kinetic energy is minimum, potential energy is maximum

B. Both kinetic and potential energies are maximum

C. Kinetic energy is maximum, potential energy is minimum

D. Kinetic energy is maximum, potential energy is minimum

Answer: C

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21. Displacement between maximum potential energy position energy potential and maximum kinetic energy position for a particle executing $S.\ H.\ M$ is

A. $-a$

B. $+a$

C. $\pm a$

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

Answer: C

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22. When a mass M is attached to the spring of force constant k , then the spring stretches by . If the mass oscillates with amplitude l , what will be maximum potential energy stored in the spring

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

B. 2 kl

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

D. Mgl

Answer: C

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23. The potential energy of a simple harmonic oscillator when the particle is half way to its end point is

(where, E is 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

Watch Video Solution

24. 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. P. E is mazimum when x=0

B. K.E is maximum when x=0

C. T.E is zero when x=0

D. K.E is maximum when x is maximum\

Answer: B

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25. If lt E gt and lt U gt denote the average kinetic and the average potential energies respectively of mass describing a simple harmonic motion, over one period, then the correct relation is

A. $< E > \ = \ < U >$

B. $< E > \ = 2 < U >$

C. $< E > \ = \ - 2 < U >$

D. $< E > \ = \ \prec U >$

Answer: A

View Text Solution

26. 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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27. The kinetic energy of a particle executing S.H.M. is 16 J when it is at its mean position. If the mass of the particle is 0.32 kg , then what is the maximum velocity of the particle

A. 5 m/s

B. 15 m/s

C. 10 m/s

D. 20 m/s

Answer: C

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28. Consider the following statements. The total energy of a particle executing simple harmonic motion depends on its

(1) Amplitude

(2) Period

(3) Displacement Of these statements

A. (1) and (2) are correct

B. (2) and (3) are correc

C. (1) and (3) are correct

D. (1), (2) and (3) are correct

Answer: A

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29. A particle starts simple harmonic motion from the mean position. Its amplitude is a and total energy E . At one instant its kinetic energy is 3E/4 . Its displacement at that instant is

A. $a/\sqrt{2}$

B. a/2

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

D. $a/\sqrt{3}$

Answer: B

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

A. f/2

B. f

C. 2f

D. 4f

Answer: C

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31. The amplitude of a particle executing SHM is made three-fourth keeping its time period constant. Its total energy will be

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

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

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

D. none of these

Answer: C

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32. A particle of mass m is hanging vertically by an ideal spring of force constant K . If the mass is made to oscillate vertically, its total energy is

A. Maximum at extreme position

B. Maximum at mean position

C. Minimum at mean position

D. Same at all position

Answer: D

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33. A body is moving in a room with a velocity of $20m/s$ perpendicular to the two walls separated by 5 meters These is no friction and the collisions with the walls are elastic .The motion of the body is

A. Not periodic

B. Periodic but not simple harmonic

C. Periodic and simple harmonic

D. Periodic with variable time perio

Answer: B

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34. A body is executing simple harmonic motion. At a 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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Time Period And Frequency

1. A particle moves such that its acceleration a is given by a = -bx , where x is the displacement from equilibrium positionand is a constant. The period of oscillation is

A. $2\pi\sqrt{b}$

B. $\dfrac{2\pi}{\sqrt{b}}$

C. $2\dfrac{\pi}{b}$

D. $2\sqrt{\dfrac{\pi}{b}}$

Answer: B

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2. The equation of SHM of a particle is $\frac{d^2y}{dt^2} + ky = 0$, where k is a positive constant. The time period of motion is

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

B. $2\pi K$

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

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

Answer: C

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3. A tunnel has been dug through the centre of the earth and a ball is released in it. It will reach the other end of the tunnel after

A. 84.6 min

B. 42.3 min

C. 1 day

D. Will not reach the other end

Answer: B

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4. The maximum speed of a particle executing S.H.M. is 1 m/s and its maximum acceleration is$1.57 m / \sec^2$. The time period of the particle will be

A. $\frac{1}{1.57} \sec$

B. 1.57 sec

C. 2 sec

D. 4 sec

Answer: D

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5. The motion of a particle executing S.H.M. is given by $x = 0.01 \sin 100\pi(t + .05)$, where x is in metres and time is in seconds. The time period is

A. 0.01 sec

B. 0.02 sec

C. 0.1 sec

D. 0.2 sec

Answer: B

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6. The kinetic energy of a particle executing SHM is 16J. When it is in its mean position. If the amplitude of oscillation is 25cm and the mass of the particle is 5.12 kg, the time period of its oscillation in second is

A. $\frac{\pi}{5}$sec

B. 2π sec

C. 20π sec

D. 5π sec

Answer: A

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7. The acceleration of a particle performing S.H.M. is $12cm/\sec^2$ cm at a distance of 3 cm form the mean position. Its period is

A. 0.5 sec

B. 1.0 sec

C. 2.0 sec

D. 3.14 sec

Answer: D

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8. To make the frequency double of an oscillator, we have to

A. Double the mass

B. Half the mass

C. Quadruple the mass

D. Reduce the mass to one-fourth

Answer: D

Watch Video Solution

9. What is constant in S.H.M.

A. Restoring force

B. Kinetic energy

C. Potential energy

D. Periodic time

Answer: D

Watch Video Solution

10. If a simple harmonic oscillator has got a displacement of $0.02m$ and acceleration equal to $2.0ms^{-2}$ at any time, the angular frequency of the oscillator is equal to

A. $10 rad s^{-1}$

B. $0.1 rad s^{-1}$

C. $100 rad s^{-1}$

D. $1 rad s^{-1}$

Answer: A

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11. The equation of a simple harmonic motion is $X = 0.34\cos(3000t + 0.74)$ where X and t are in mm and sec . The frequency of motion is

A. 3000

B. $3000 / 2\pi$

C. $0.74 / 2\pi$

D. $3000 / \pi$

Answer: B

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12. Mark the wrong statement

A. All S.H.M.'s have fixed time period

B. All motion having same time period are S.H.M

C. In S.H.M. total energy is proportional to square of amplitude

D. Phase constant of S.H.M. depends upon initial conditions

Answer: B

Watch Video Solution

13. A particle is SHM is discribed by the displacement function $x(t) = a\cos(\omega t + \theta)$ 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. 1 cm

B. $\sqrt{2} cm$

C. 2 cm

D. 2.5 cm

Answer: B

Watch Video Solution

14. A particle executes SHM in a line 4 cm long. Its velocity when passing through the centre of line is 12 cm/s . The period will be

A. 20.47 s

B. 1.047 s

C. 3.047 s

D. 0.047 s

Answer: B

Watch Video Solution

15. The displacement x (in metre) of a particle in, simple harmonic motion is related to time t (in second) as

$$x = 0.01 \cos\left(\pi t + \frac{\pi}{4}\right)$$

the frequency of the motion will be

A. 0.5 Hz

B. 1.0 Hz

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

D. πHz

Answer: C

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16. A simple harmonic wave having an amplitude a and time period T is represented by the equation y =

$5\sin\pi(t+4)m$. Then the value of amplitude (a) in (m) and time period (T) in second are

A. a=10 , T= 2

B. a= 5, T= 1

C. a=10 , T = 1

D. a= 5, T=2

Answer: C

Watch Video Solution

17. A particle executing simple harmonic motion of amplitude 5 cm has maximum speed of 31.4 cm / s .

The frequency of its oscillation is

A. 3 Hz

B. 2 Hz

C. 4 Hz

D. 1 Hz

Answer: D

Watch Video Solution

18. The displacement x(in metres) of a particle performing simple harmonic motion is related to time t(in seconds) as $x = 0.05 \cos\left(4\pi t + \frac{\pi}{4}\right)$ .the frequency of the motion will be

A. 0.5 Hz

B. 1.0 Hz

C. 1.5 Hz

D. 2.0 Hz

Answer: D

Watch Video Solution

Simple Pendulum

1. The period of a simple pendulum is doubled, when

A. Its length is doubled

B. The mass of the bob is doubled

C. Its length is made four times

D. The mass of the bob and the length of the pendulum are doubled

Answer: C

Watch Video Solution

2. The period of oscillation of a simple pendulum of constant length at earth surface is T. Its period inside a mine is C

A. Greater than T

B. Less than T

C. Equal to T

D. connot be compared

Answer: A

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3. A simple pendulum has a hollow sphere containing mercury suspended by means of a wire. If a little mercury is drained off, the period of the pendulum will

A. Remains unchanged

B. Increase

C. Decrease

D. Become erratic

Answer: B

Watch Video Solution

4. A simple pendulum suspended from the ceiling of a trans has a time period T when the train is at rest. If the train is accelerating uniformly at a then its time period

A. increase

B. Decrease

C. Remain unaffected

D. become infinite

Answer: D

Watch Video Solution

5. 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 sec

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

Answer: B

Watch Video Solution

6. 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

A. $\left(\tan^{-1}\right)\frac{a}{g}$ in the forward direaction

B. $\left(\tan^{-1}\right)\frac{a}{g}$ in the backward direaction

C. $\left(\tan^{-1}\right)\frac{g}{a}$ in the backward direaction

D. $\left(\tan^{-1}\right)\frac{g}{a}$ in the forward direction

Answer: B

Watch Video Solution

7. Which of the following statements is not true ? In the case of a simple pendulum for small amplitudes the period of oscillation is

A. Directly proportional to square root of the length of the pendulum

B. Inversely proportional to the square root of the acceleration due to gravity

C. Dependent on the mass, size and material of the bob

D. Independent of the amplitude

Answer: C

Watch Video Solution

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

A. 4 sec

B. 1 sec

C. 2 sec

D. 8 sec

Answer: C

Watch Video Solution

9. A man measures the period of a simple pendulum inside a stationary lift and finds it to be T sec. if the lift accelerates upwards with an acceleration g/4, then the period of the pendulum will be

A. T

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

C. $2\frac{T}{\sqrt{5}}$

D. $2T\sqrt{5}$

Answer: C

Watch Video Solution

10. A simple pendulum is suspended from the roof of a trolley which moves in a horizontal direction with an acceleration α, then the time period is given by $T = 2\pi\sqrt{\left(\frac{I}{T}\right)}$ where g is equal to

A. g

B. g-a

C. g+ a

D. $\sqrt{g^2 + a^2}$

Answer: D

Watch Video Solution

11. A second's pendulum is placed in a space laboratory orbiting around the earth at a height $3R$, where R is the radius of the earth. The time period of the pendulum is

A. zero

B. $2\sqrt{3}\,\mathrm{sec}$

C. 4 sec

D. infinite

Answer: D

Watch Video Solution

12. The bob of a simple pendulum of mass m and total energy E will have maximum linear momentum equal to

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

B. $\sqrt{2mE}$

C. 2 mE

D. mE^2

Answer: B

Watch Video Solution

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

A. 1/6 m

B. 6 m

C. 1/36 m

D. 36 m

Answer: A

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14. If the length of a seconds pendulum is increased by 2% then in a day the pendulum

A. 3927 sec

B. 3727 sec

C. 3427 sec

D. 864 sec

Answer: D

Watch Video Solution

Watch Video Solution

15. The period of simple pendulum is measured as T in a stationary lift. If the lift moves upwards with an acceleration of 5 g, the period will be

A. the same

B. increased by 3/5

C. Decreased by 2/3 times

D. None of the above

Answer: D

Watch Video Solution

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

A. Increase by 1%

B. Increase by 0.5%

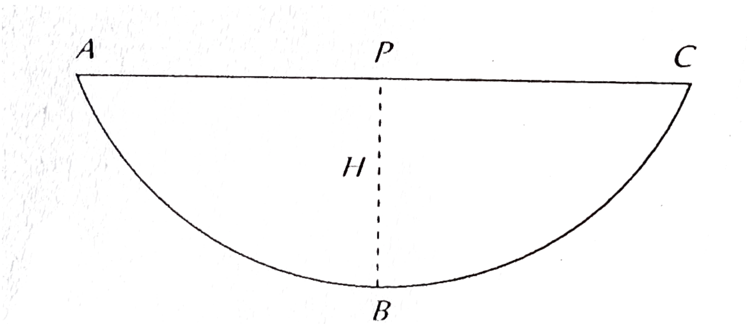
C. Decrease by 0.5%

D. Increase by 2%

Answer: B

Watch Video Solution

17. A simple pendulum with a bob of mass 'm' oscillates from A to C and back to A such that PB is H . If the acceleration due to gravity is 'g' then the velcoity of the bob as it passes through B is



A. mgH

B. $\sqrt{2gH}$

C. 2gh

D. zero

Answer: B

Watch Video Solution

18. idenigu correcy statement among the following

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

B. A simple pendulum with a bob of mass M swings with an angular amplitude of 40°, the tension in the string is less than $Mg\cos 20^{\circ}$

C. As the length of a simple pendulam is increased m the maximum velcoity of its bob during its oscillation will also decreases

D. The freactional change in the time period of a pendulum on changing the temperature is independent of the length of the pendulum

Answer: C

View Text Solution

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

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

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

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

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

Answer: C

Watch Video Solution

20. A simple pendulum executing S.H.M. is falling freely along with the support. Then

A. Its periodic time decreases

B. Its periodic time increases

C. It does not oscillate at all

D. None of these

Answer: C

Watch Video Solution

21. A pendulum bob has a speed 3m/s while passing thorugh its lowest position. What is its speed when it makes an angle of 60^0 with the vertical? The length of the pendulum is 0.5m Take $g = 10\frac{m}{s^2}$.

A. 3 m/s

B. $\frac{1}{3} m / s$

C. $\frac{1}{2} m / s$

D. 2 m/s

Answer: D

Watch Video Solution

22. The time period of a simple pendulum is 2s. It its length is increased by 4 times, then its period becomes

A. 16 sec

B. 12 sec

C. 8 sec

D. 4 sec

Answer: D

Watch Video Solution

23. If the metal bob of a simple pendulum is replaced by a wooden bob, then its time period will

A. Increase

B. Decrease

C. Remain the same

D. First increase then decrease

Answer: C

Watch Video Solution

24. In a simple pendulum the period of oscillation (T) is related to the length of the pendulum (L) as

A. $\frac{l}{T}$ = constant

B. $\frac{l^2}{T}$ = constant

C. $\frac{l}{T^2}$ = constant

D. $\frac{l^2}{T^2}$ = constant

Answer: C

Watch Video Solution

25. A pendulum has time period T . If it is taken on to another planet having acceleration due to gravityhalf and mass 9 times that of the earth then its time period on the other planet will be

A. $\sqrt{T}$

B. T

C. $T^{1/3}$

D. $\sqrt{2}T$

Answer: D

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

A. 0.1

B. 0.21

C. 0.3

D. 0.5

Answer: A

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27. If the length of simple pendulum is increased by 300%, then the time period will be increased b

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

28. The length of a seconds penulum is

A. 99.8 cm

B. 99cm

C. 100cm

D. none of these

Answer: B

Watch Video Solution

29. The time period of a simple pendulum in a lift descending with constant acceleration g is

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

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

C. zero

D. infinite

Answer: D

Watch Video Solution

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

A. Become infinite

B. Remain same

C. Increase

D. Decrease

Answer: D

Watch Video Solution

31. Calculate the tiem period of a simple pendulum of length one meter. The acceleration due ot gravity at the place is $\pi^2 ms^{-2}$.

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

B. $2\pi \sec$

C. 2 sec

D. $\pi \sec$

Answer: C

Watch Video Solution

32. A plate oscillating on a horizontal plane oscillation with time period T suddenly another plate put on the first plate, then time period

A. Will decrease

B. Will increase

C. will be same

D. none of these

Answer: C

Watch Video Solution

33. A simple pendulum of length l has a brass bob attached at its lower end. Its period is T . If a steel bob of same size, having density x times that of brass, replaces the brass bob and its length is changed so that period becomes 2 T, then new length is

A. $2l$

B. $4l$

C. $4lx$

D. $\frac{4l}{x}$

Answer: B

Watch Video Solution

34. In a seconds pendulum, mass of bob is 30 gm . If it is replaced by 90 gm mass. Then its time period will

A. 1 sec

B. 2 sec

C. 4 sec

D. 3 sec

Answer: B

Watch Video Solution

35. The time period of a simple pendulum when it is made to oscillate on the surface of moon

A. Increases

B. Decreases

C. Remains unchanged

D. Becomes infinite

Answer: A

Watch Video Solution

36. A simple pendulum is attached to the roof of a lift. If time period of oscillation, when the lift is stationary is T . Then frequency of oscillation, when the lift falls freely, will be

A. zero

B. T

C. 1/T

D. none of these

Answer: A

Watch Video Solution

37. A simple pendulum, suspended from the ceiling of a stationary van, has time period T . If the van starts moving with a uniform velocity the period of the pendulum will be

A. Less than T

B. Equal to 2 T

C. Greater than T

D. Unchanged

Answer: D

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38. The length of a simple pendulum is increased by 44%. The percentage increase in its time period will be

A. 0.22

B. 0.2

C. 0.33

D. 0.44

Answer: B

Watch Video Solution

39. To show that a simple pendulum executes simple harmonic motion, it is necessary to assume tha

A. Length of the pendulum is small

B. Mass of the pendulum is small

C. Amplitude of oscillation is small

D. Acceleration due to gravity is small

Answer: C

Watch Video Solution

40. The height of a swing changes during its motion from 0.1 m to 2.5 m . The minimum velocity of a boy who swings in this swing is

A. 5.4 m/s

B. 4.95 m/s

C. 3.14 m/s

D. zero

Answer: D

Watch Video Solution

41. The amplitude of an oscillating simple pendulum is 10 cm and its period is 4 sec . Its speed after 1 sec after it passes its equilibrium position, is

A. zero

B. 0.57 m/s

C. 0.212 m/s

D. 0.32 m/s

Answer: A

Watch Video Solution

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

A. zero

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

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

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

Answer: A

Watch Video Solution

43. 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 constant

Answer: A

Watch Video Solution

44. The periodic time of a simple pendulum of length 1 m and amplitude 2 cm is 5 seconds. If the amplitude is made 4 cm , its periodic time in seconds will be

A. 2.5

B. 5

C. 10

D. $5\sqrt{2}$

Answer: B

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45. The ratio of frequencies of two pendulums are 2 : 3, then their length are in ratio

A. $\sqrt{2/3}$

B. $\sqrt{3/2}$

C. $\frac{4}{9}$

D. $\frac{9}{4}$

Answer: D

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46. Two pendulums begin to swing simultaneously. If the ratio of the frequency of oscillations of the two is 7 : 8, then the ratio of lengths of the two pendulums will be

A. $7:8$

B. $8:7$

C. $49:64$

D. $64 : 49$

Answer: D

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47. A simple pendulum hanging from the ceiling of a stationary lift has a time period T 1 . When the lift moves downward with constant velocity, the time period is T, then

A. T_2 is infinity

B. $T_2 > T_1$

C. $T_2 < T_1$

D. $T_2 = T_1$

Answer: B

Watch Video Solution

48. If the length of a pendulum is made 9 times and mass of the bob is made 4 times then the value of time period becomes

A. 3T

B. 3/2 T

C. 4 T

D. 2T

Answer: A

Watch Video Solution

49. A simple pendulum is taken from the equator to the pole. Its period

A. Decrease

B. Increases

C. Remains the same

D. Decreases and then increases

Answer: A

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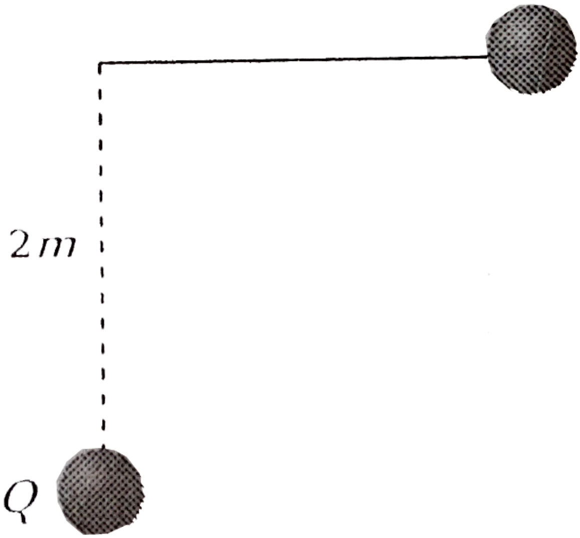
50. A pendulum of length 2 m lift at P . When it reaches Q , it losses 10% of its total energy due to air resistance. The velocity at Q is



A. 6 m/sec

B. 1 m/ sec

C. 2 m/sec

D. 8 m/sec

Answer: A

Watch Video Solution

51. There is a simple pendulum hanging from the ceiling of a lift. When the lift is stand still, the time period of the pendulum is T . If the resultant acceleration becomes $g/4$,then the new time period of the pendulum is

A. 0.8 T

B. 0.25 T

C. 2 T

D. 4 T

Answer: C

Watch Video Solution

52. The time period of a simple pendulum measured inside a stationary lift is found to be T . If the lift starts accelerating upwards with an acceleration $g/3$, the time period is

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

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

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

D. $\sqrt{3}T$

Answer: C

Watch Video Solution

53. Time period of a simple pendulum will be double, if we

A. Decrease the length 2 times

B. Decrease the length 4 times

C. Increase the length 2 times

D. Increase the length 4 times

Answer: C

Watch Video Solution

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

A. $mgl\sin\theta$

B. $mgl(l+\sin\theta)$

C. $mgl(l+\cos\theta)$

D. $mgl(l - \cos\theta)$

Answer: D

Watch Video Solution

55. The velocity of simple pendulum is maximum at

A. Extremes

B. Half displacement

C. Mean position

D. Every where

Answer: C

Watch Video Solution

56. A simple pendulum is vibrating in an evacuated chamber, it will oscillate with

A. Increasing amplitude

B. Constant amplitude

C. Decreasing amplitude

D. First (c) then (a)

Answer: B

Watch Video Solution

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

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

B. $\pi\sqrt{\frac{3L}{g}}$

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

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

Answer: C

Watch Video Solution

58. if a boby is released into a tunal dug across the diameter of earth, it executes simple harmonic motoin with time period

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

B. $T = 2\pi\sqrt{\frac{2R_e}{g}}$

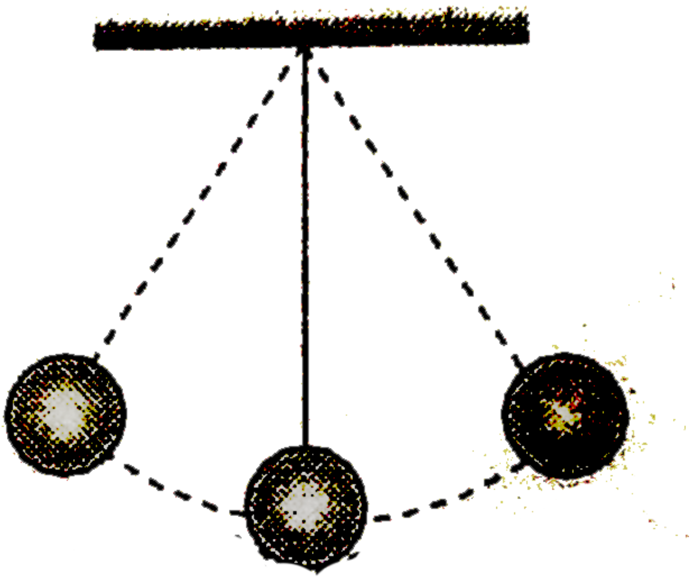
C. $T = 2\pi\sqrt{\frac{R_e}{2g}}$

D. $T = 2$ seconds

Answer: A

Watch Video Solution

59. What is the velocity of the bob of a simple pendulum at its mean position, if it is able to rise to vertical height of 10 cm (take $g = 9.8m / s^2$)



A. 2.2 m/s

B. 1. 8 m/s

C. 1. 4 m/s

D. 0.6 m/s

Answer: C

Watch Video Solution

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

A. Less than T

B. Greater than T

C. Equal to T

D. Infinite

Answer: A

Watch Video Solution

61. What effect occurs on the frequency of a pendulum if it is taken from the earth surface to deep into a mine

A. Increases

B. Decreases

C. First increases then decrease

D. None of these

Answer: B

Watch Video Solution

Spring Pendulum

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

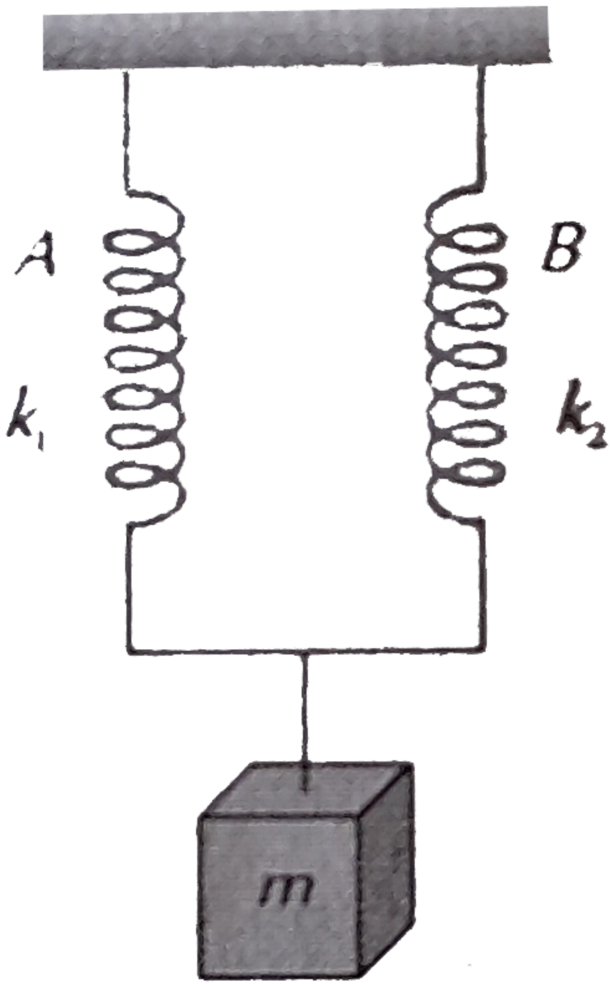
C. $\frac{k_2}{k_1}$

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

Answer: D

Watch Video Solution

2. A mass m is suspended by means of two coiled spring which have the same length in unstretched condition as in figure. Their force constant are k 1 and k 2 respectively. When set into vertical vibrations, the period will be



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

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

C. $2\pi\sqrt{\dfrac{m}{k_1 - k_2}}$

D. $2\pi\sqrt{\dfrac{m}{k_1 + k_2}}$

Answer: D

Watch Video Solution

3. A spring has a certain mass suspended from it and its period for vertical oscillations is T_1. The spring is now cut into two equal halves and the same mass is suspended from one of the half. The period of vertical oscillation is now T_2. The ratio of T_2 / T_1 is

A. $\dfrac{T}{2}$

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

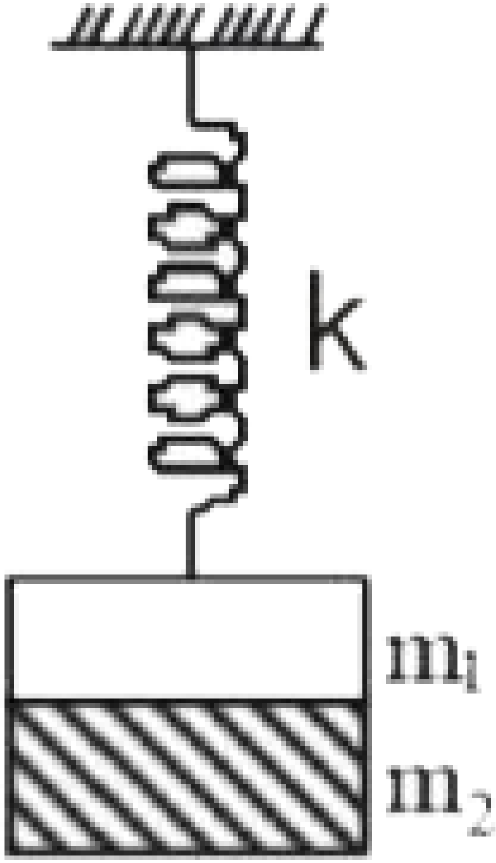
C. $\sqrt{2T}$

D. 2T

Answer: B

Watch Video Solution

4. Two masses m_1 and m_2 are suspended together by a massless spring of constant K. When the masses are in equilibrium, m_1 is removed without disturbing the system. Then the angular frequency of oscillation of m_2 is -



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

B. $\sqrt{\frac{k}{m_2}}$

C. $\sqrt{\dfrac{k}{m_1 + m_2}}$

D. $\sqrt{\dfrac{k}{m_1 m_2}}$

Answer: B

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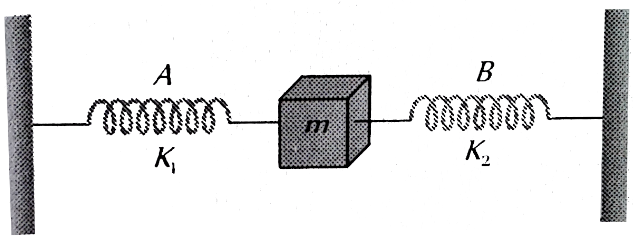
5. In arrangement given in figure, if the block of mass m is displaced, the frequency is given by



A. $n = \dfrac{1}{2\pi}\sqrt{\dfrac{k_1 - k_2}{m}}$

B. $n = \frac{1}{2\pi}\sqrt{\frac{k_1 + k_2}{m}}$

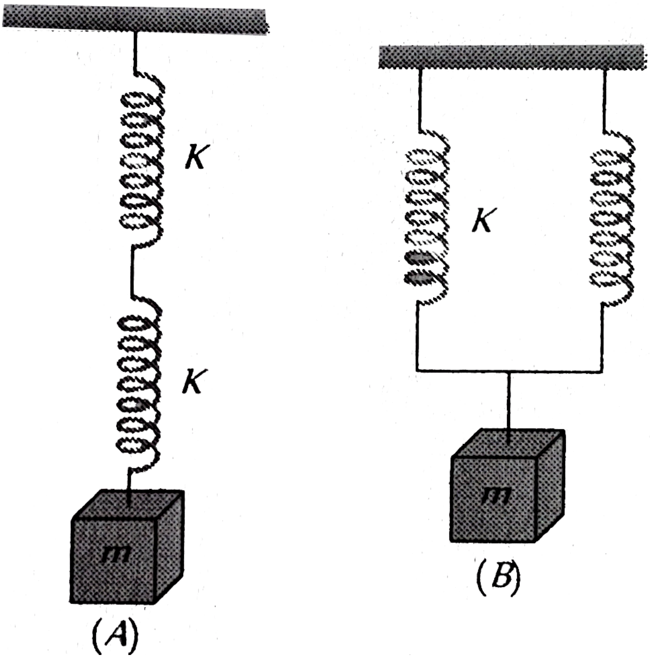
C. $n = \frac{1}{2\pi}\sqrt{\frac{m}{k_1 + k_2}}$

D. $n = (2\pi)\sqrt{\frac{m}{k_1 - k_2}}$

Answer: B

Watch Video Solution

6. Two identical spring of constant K are connected in series and parallel as shown in figure. A mass mis suspended from them. The ratio of their frequencies of vertical oscillations will be



A. $2:1$

B. $1:1$

C. $1:2$

D. $4:1$

Answer:

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

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

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

C. $T = 2\pi\sqrt{\frac{m(K_1 + K_2)}{k_1 + k_2}}$

D. $T = 2\pi\sqrt{\left(\frac{mK_1K_2}{k_1 + k_2}\right)}$

Answer:

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8. A spring is stretched by 0.20 m , when a mass of 0.50 kg is suspended. When a mass of 0.25 kg is suspended, then its period of oscillation will be $\left(g=10m/s^2\right)$

A. 0.328 sec

B. 0.628 sec

C. 0.137 sec

D. 1.00 sec

Answer: B

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

B. 25/16

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

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

Answer: A

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

A. K/2

B. K

C. 2K

D. K^2

Answer: C

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11. A massless spring, having force constant k, oscillates with frequency n when a mass m is suspended from it. The spring is cut into two equal halves and a mass $2m$ is suspended from one half. The frequency of oscillation will now be

A. n

B. 2n

C. $n/\sqrt{2}$

D. $n^{(2)^{1/2}}$

Answer: A

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12. A mass M is suspended from a light spring. An additional mass m added to it displaces the spring further by distance x then its time period is

A. $T = 2\pi\sqrt{(mg/x(M+m))}$

B. $T = 2\pi\sqrt{(M+m)x/mg})$

C. $T = \pi / 2\sqrt{(mg / x(M + m))}$

D. $T = 2\pi\sqrt{(M + m / mgx)}$

Answer: B

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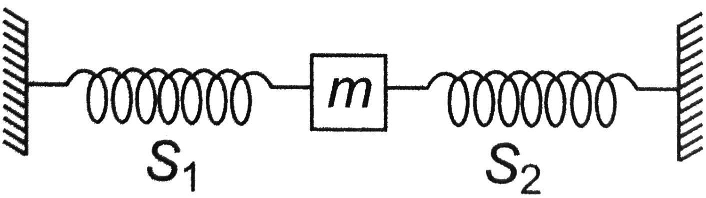
13. In figure S_1 andS_1 are identical springs. The oscillation frequency of the mass m is f. if one spring is removed, the frequency will become



A. f

B. $F \times 2$

C. $F \times \sqrt{2}$

D. $f / \sqrt{2}$

Answer: D

Watch Video Solution

14. The vertical extension in a light spring by a weight of 1 kg suspended from the wire is 9.8 cm . The period of oscillation

A. 20π cm

B. 2πsec

C. $2\pi / 10$ sec

D. 200π sec

Answer: C

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15. A particle of mass 200 g executes a simpel harmonit motion. The resrtoring force is provided by a spring of spring constant $80Nm^{-1}$. Find the time period.

A. 0.31 sec

B. 0.15 sec

C. 0.05 sec

D. 0.02 sec

Answer: A

Watch Video Solution

16. The length of a spring is l and its force constant is k . When a weight W is suspended from it, its length increases by x . If the spring is cut into two equal parts and put in parallel and the same weight W is suspended from them, then the extension will be

A. 2x

B. x

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

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

Answer: D

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17. A block is placed on a frictionless horizontal table. The mass of the block is m and springs are attached on either side with force constants K_1 and K_2. If the block is displaced a little and left to oscillate, then the angular frequency of oscillation will be

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

B. $\left[\frac{K_1+K_2}{m(K_1+K_2)}\right]^{1/2}$

C. $\left[\frac{K_1+K_2}{(K_1-K_2)m}\right]^{1/2}$

D. $\left[\frac{K_1K_2}{(K_1+K_2)m}\right]^{1/2}$

Answer: A

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18. A spring of certain length and having spring constant k is cut into two pieces of length in a ratio

$1:2$. The spring constants of the two pieces are in a ratio :

A. $1:3$

B. $1:2$

C. $2:3$

D. $2:1$

Answer: D

Watch Video Solution

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

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

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

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

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

Answer: B

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20. A block of mass m, attached to a spring of spring constant k, oscilltes on a smooth horizontal table. The other end of the spring is fixed to a wall. If it has speed v when the spring is at its naturla lenth, how far will it move on the table before coming to an instantaneous rest?

A. $x = \sqrt{m/k}$

B. $x = \frac{1}{v}\sqrt{m/k}$

C. $x = v\sqrt{m/k}$

D. $x = \sqrt{mv/k}$

Answer: C

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Watch Video Solution

21. The force constants of two springs are K_1 and K_2. Both are stretched till their elastic energies are equal. If the stretching forces are F_1 and $F_2 then F_1 : F_2$ is

A. $K_1 : K_2$

B. $K_2 : K_1$

C. $\sqrt{k_1} : \sqrt{K_2}$

D. $K_1^2 : K_2^2$

Answer: C

Watch Video Solution

22. A mass m is vertically suspended from a spring of negligible mass, the system oscillates with a frequency n. what will be the frequency of the system, if a mass $4m$ is suspended from the same spring?

A. n/4

B. 4n

C. n/2

D. 2n

Answer: C

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23. If the period of oscillation of mass M suspended from a spring is one second, then the period of 4M will be

A. 1 sec

B. 2 sec

C. 3 sec

D. 4 sec

Answer: D

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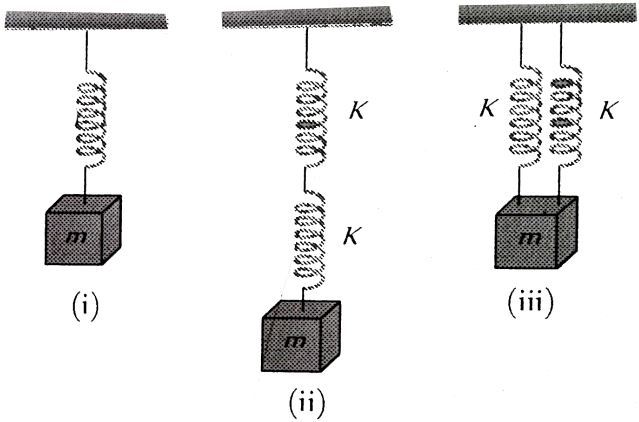
24. Five identical springs are used in the following three configurations. The time periods of vertical oscillations in configurations (i), (ii) and (iii) are in the ratio



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

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

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

D. $2 : \frac{1}{\sqrt{2}} : 1$

Answer: A

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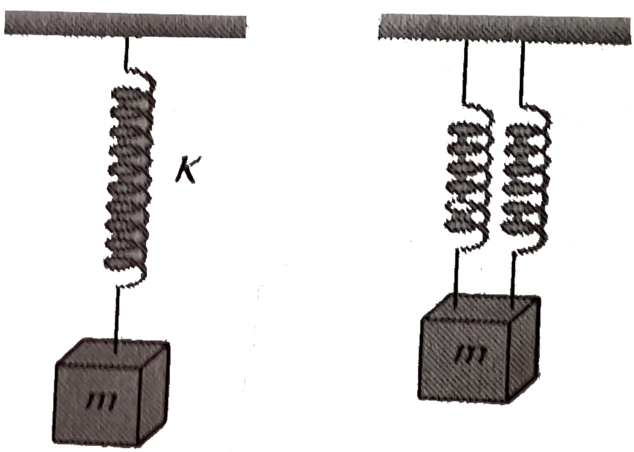
25. A mass m performs oscillations of period T when hanged by spring of force constant K . If spring is cut in two parts and arranged in parallel and same mass is oscillated by them, then the new time period will



be

A. 2T

B. T

C. $\frac{T}{\sqrt{2}}$

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

Answer: D

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26. If a watch with a wound spring is taken on to the moon, it

A. Runs faster

B. Runs slower

C. Does not work

D. Shows no change

Answer: D

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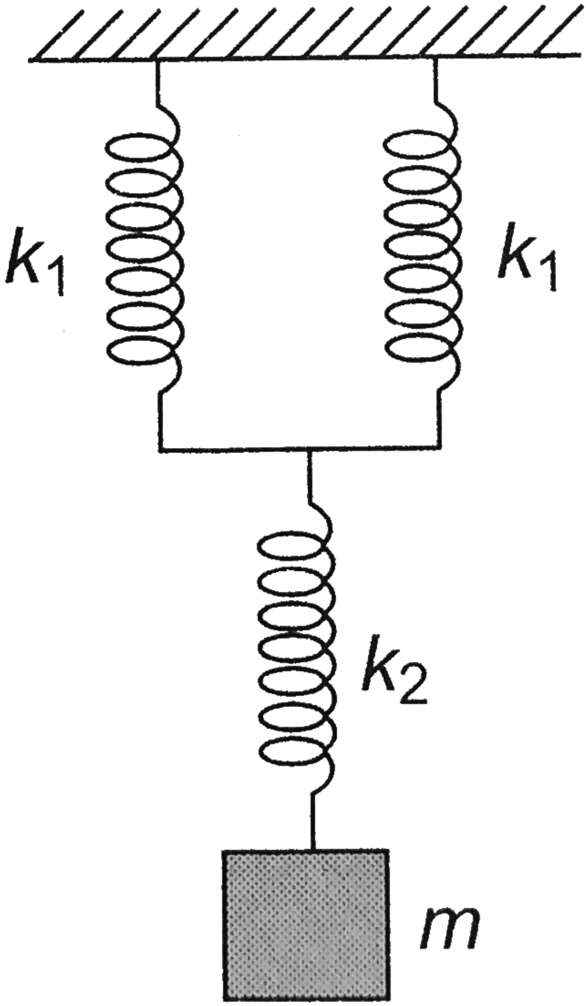
27. What will be the force constant of the spring system shown in figure?



A. $\dfrac{K_1}{2}+K_2$

B. $\left[\dfrac{1}{2K_1}+\dfrac{1}{K_1}\right]^{-1}$

C. $\dfrac{2}{2K_1}+\dfrac{1}{K_1}$

D. $\left[\frac{2}{K_1}+\frac{1}{K_1}\right]^{-1}$

Answer: B

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28. Two springs have their force constants K_1 and K_2 and they are stretched to the same extension. If $K_2 > K_1$ work done is

A. More in spring A

B. more in sping B

C. Equal in both

D. Noting can be said

Answer: A

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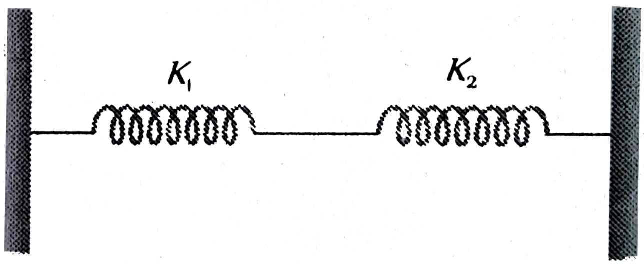
29. The effective spring constant of two spring system as shown in figure will be



A. $K_1 + K_2$

B. $K_1K_2 / K_1 + K_2$

C. $K_1 - K_2$

D. $K_1K_2\,/\,K_1 - K_2$

Answer: A

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30. A mass (M) attached to a spring, oscillates with a period of (2 sec). If the mass in increased by (2 kg) the period increases by one sec. Find the initial mass (M) assuming that Hook's Law is obeyed.

A. 1.6 kg

B. 3.9 kg

C. 9.6 kg

D. 12.6 kg

Answer: A

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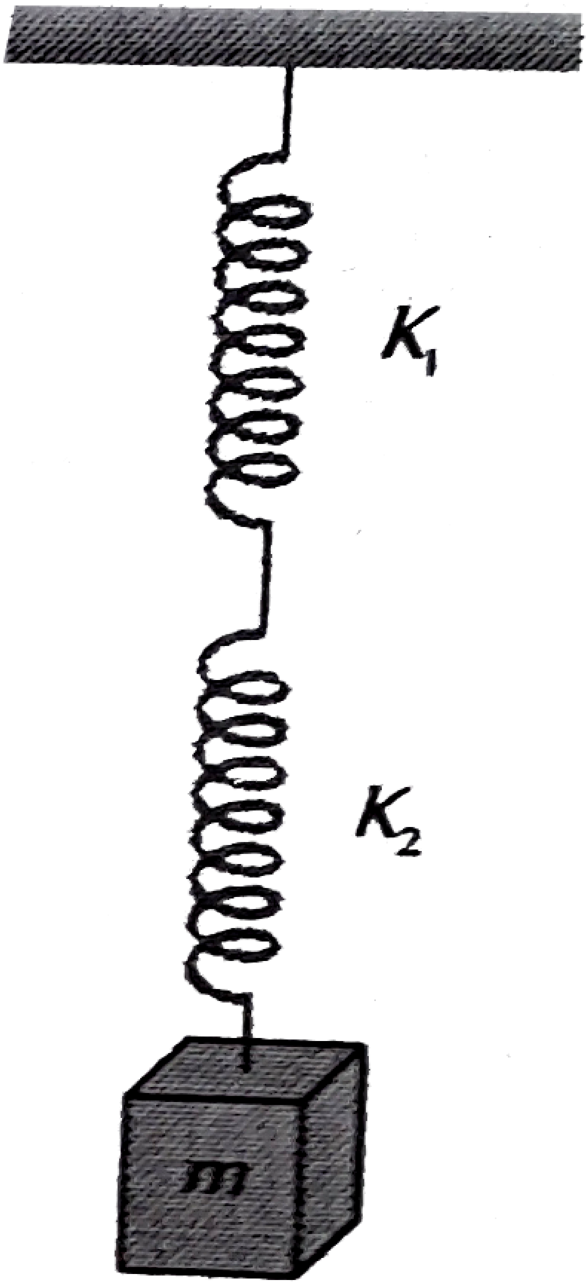
31. A mass M is suspended by two springs of force constants K_1 and K_2 respectively as shown in the diagram. The total elongation (stretch) of the two



springs is

A. $\dfrac{mg}{K_1 + K_2}$

B. $\dfrac{mg(K_1 + K_2)}{K_1 K_2}$

C. $\dfrac{mgK_1K_2}{K_1 + K_2}$

D. $\dfrac{K_1 + K_2}{K_1K_2mg}$

Answer: B

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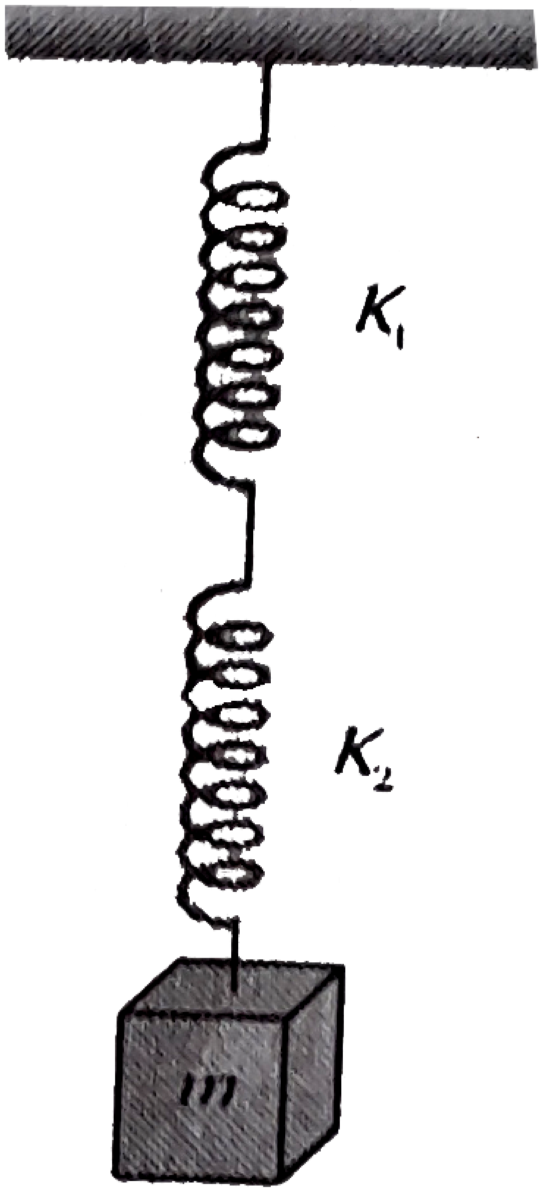
32. The frequency of oscillation of the springs shown in the figure will be



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

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

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

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

Answer: D

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33. The scale of a spring balance reading from 0 to 10 kg is 0.25 m long. A body suspended from the balance oscillates vertically with a period of $\pi/10$ second. The mass suspended is (neglect the mass of the spring)

A. 10 kg

B. 0.98 kg

C. 5 kg

D. 20 kg

Answer: B

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34. 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. nT

D. T

Answer: B

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35. One-forth length of a spring of force constant K is cut away. The force constant of the remaining spring will be

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

B. $\frac{4}{3}K$

C. K

D. 4 K

Answer: B

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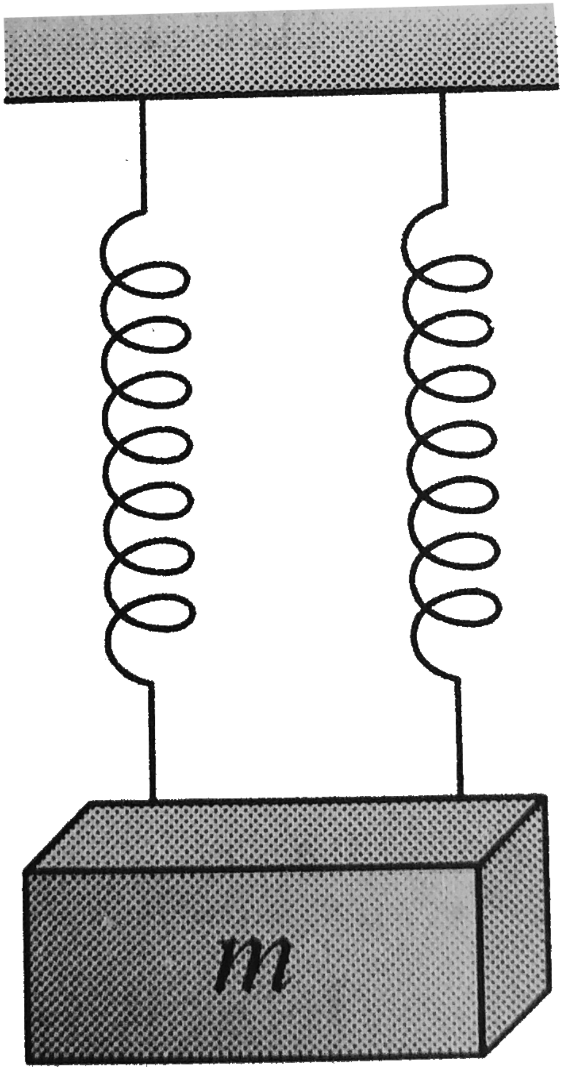
36. A mass m is suspended separately by two different spring of spring constant K_1 and k_2 given the time period t_1 andt_2 respectively if the same mass m is shown in the figure then time period t is given by the relation



A. $t = t_1 + t_2$

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

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

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

Answer: D

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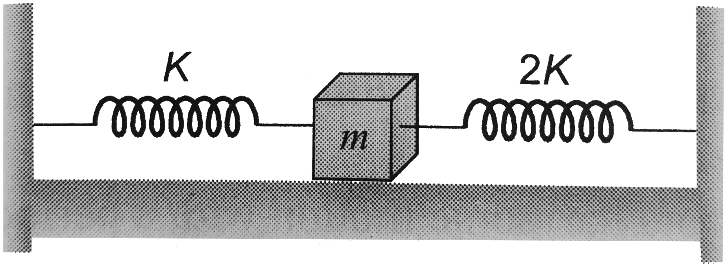
37. Two spring of force constants K and $2K$ are connected a mass m below The frequency of oscillation the mass is



A. (1/2)

B. $1/2$

C. $(1/2\pi)\sqrt{(2k/m)}$

D. $(1/2\pi)\sqrt{m/k}$

Answer: C

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38. Two springs of spring constantsK_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. $k_1k_2/k_1 + k_2$

Answer: D

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39. A particle at the end of a spring executes simple harmonic motion with a period t_1 while the corresponding period for another spring is t_2 if the oscillation with the two springs in series is T then

A. $T = t_2 + t_2$

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

C. $T^2 = t_1^{-1} + t_2^{-1}$

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

Answer: B

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40. Infinite springs with force constant`k , 2k, 4k and 8 k .... respectively are connected in series. The effective force constant of the spring will b

A. 2k

B. K

C. k/2

D. 2048

Answer: C

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41. To make the frequency double of a spring oscillator, we have to

A. Reduce the mass to one fourth

B. Quardruple the mass

C. Double of mass

D. Half of the mass

Answer: A

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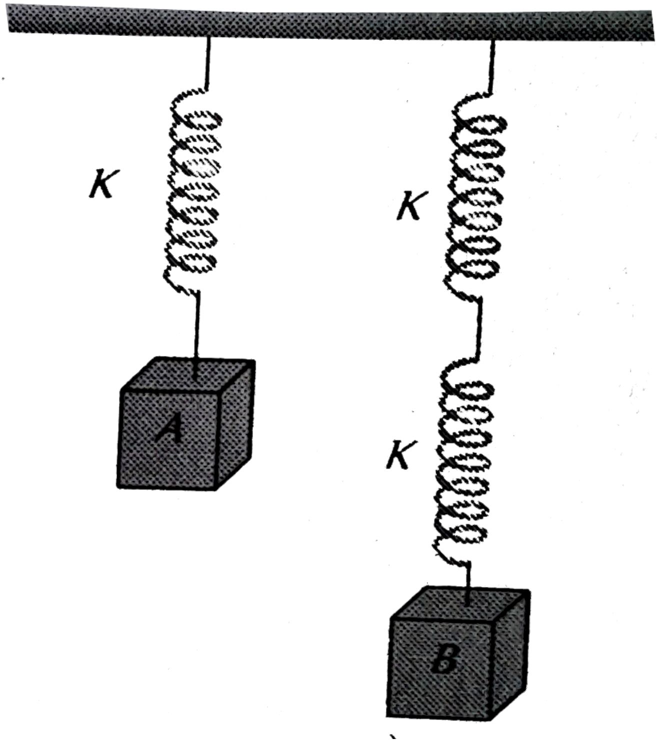
42. The springs shown are identical. When A =4 kg , the elongation of spring is 1 cm . If B = 6kg , the elongation produced by it is



A. 4 cm

B. 3cm

C. 2 cm

D. 1 cm

Answer: B

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43. When a body of mass $1.0kg$ is suspended from a certain light spring hanging vertically, its length increases by $5cm$. By suspending $2.0kg$ block to the spring and if the block is pulled through $10cm$ and released, the maximum velocity of it in $m/sis\left(g=10m/s^{2}\right)$

A. 0.5

B. 1

C. 2

D. 4

Answer: B

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44. Two springs with spring constants m $K_1 = 1500N/m$and m $K_2 = 3000N/m$ are stretched by the same force. The ratio of potential energy stored in spring will be

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: A

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45. If a spring extends by x on loading, then then energy stored by the spring is (if T is tension in the spring and k is spring constant)

A. $\frac{T^2}{2x}$

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

C. $\frac{2K}{T^2}$

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

Answer: B

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46. A weightless spring of length 60 cm and force constant 200 N/m is kept straight and unstretched on a smooth horizontal table and its ends are rigidly fixed. A mass of 0.25 kg is attached at the middle of the spring and is slightly displaced along the length.

The time period of the oscillation of the mass is

A. $\frac{\pi}{20}s$

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

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

D. $\frac{\pi}{\sqrt{200}}s$

Answer: A

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

A. T

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

C. 2T

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

Answer: B

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48. 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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49. An object is attched to the bottom of a light vertical spring and set vibrating. The maximum speed of the object is $15cm/s$ and the period is 628 milli seconds. The amplitude of the motion in centimetres is

A. 3

B. 2

C. 1.5

D. 1

Answer: C

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50. When a mass m is attached to a spring, it normally extends by 0.2 m . The mass m is given a slight addition extension and released, then its time period will be

A. $\frac{1}{7}$sec

B. 1 sec

C. $\frac{2\pi}{7}$sec

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

Answer: C

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51. If a body of mass 0.98 kg is made to oscillate on a spring of force constant 4.84 N/m the angular frequency of the body is

A. 1.22 rad/s

B. 2.22 rad/s

C. 3.22 rad/s

D. 4.22 rad/s

Answer: B

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52. A mass m is suspended from a spring of length l and force constant K . The frequency of vibration of the mass is f_1. The spring is cut into two equal parts and the same mass is suspended from one of the parts. The new frequency of vibration of mass is f_2 . Which of the following relations between the frequencies is correct

A. $f_1 = \sqrt{2} f_2$

B. $f_1 = f_2$

C. $f_1 = 2 f_2$

D. $f_2 = \sqrt{2} f_1$

Answer: D

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53. A mass m oscillates with simple harmonic motion with frequency $f = \frac{\omega}{2\pi}$ and amlitude A on a spring with constant K. therefore

A. the total energy of the system is $\frac{1}{2}KA^2$

B. The frequency is $\frac{1}{2\pi}\sqrt{\frac{K}{M}}$

C. The maximum velocity occurs, when x=0

D. all the above are correct

Answer: D

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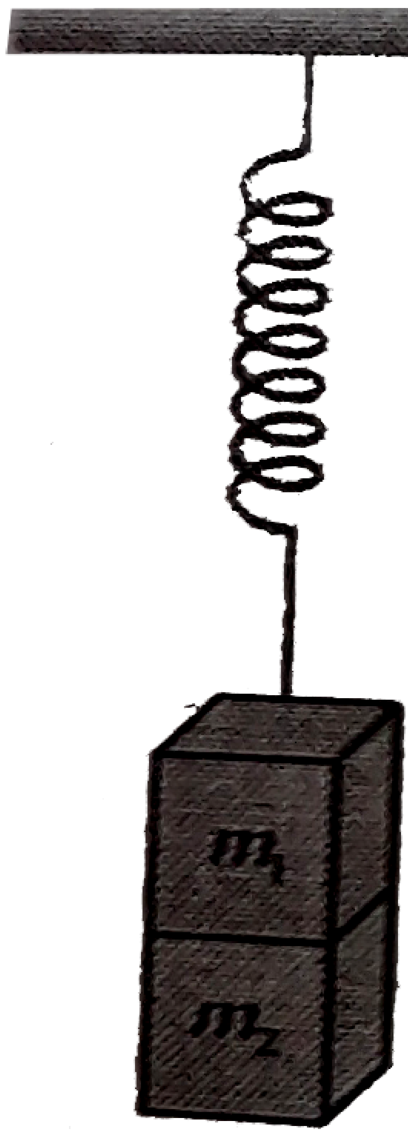
54. Two masses m 1 and m 2 are suspended together by a massless spring of constant K . When the masses are in equilibrium, m 1 is removed without disturbing the system. The amplitude of oscillations is



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

B. $\frac{m_2 g}{K}$

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

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

Answer: A

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55. A spring executes SHM with mass of 10 kg attached to it. The force constant of spring is 10 N/m. If at any instant its velocity is 40 cm/sec, the displacement will be (where amplitude is 0.5 m)

A. 0.9m

B. 0.3m

C. 0.03 m

D. 0.9 m

Answer: B

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Superposition Of S H M And Resonance

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

A. 7

B. 1

C. 5

D. 12

Answer: C

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2. If the displacement equation of a particle be represented By $y = A \sin PT + B \cos PT$ the particle executes

A. A uniform circular motio

B. A uniform elliptical motio

C. A S.H.M

D. A rectilinear motion

Answer: C

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

A. The motion is oscillatory but not S.H.M.

B. The motion is S.H.M. with amplitude a

C. The motion is S.H.M. with amplitude $a\sqrt{2}$

D. the motion is S.H.M with amplitude 2a

Answer: C

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

A. Straight line

B. Circle

C. Ellipse

D. Figure of eight

Answer: A

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

A. A circle

B. An ellipse

C. A straight line

D. A parabola

Answer: C

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7. The disperod of a particle varies according to the relation $x = 4(\cos \pi t + \sin \pi t)$. The amplitude of the particle is.

A. 8

B. -4

C. 4

D. $4\sqrt{2}$

Answer: D

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8. A S.H.M. is represented by $x = 5\sqrt{2}(\sin 2\pi t + \cos 2\pi t)$ amplitude of the S.H. M is

A. 10 cm

B. 20 cm

C. $5\sqrt{2}$

D. 50 cm

Answer: A

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9. Resonance is an example of

A. Tuning fork

B. Forced vibration

C. Free vibration

D. Damped vibration

Answer: B

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10. In case of a forced vibration the resonance wave becomes very sharp when the

A. Restoring force is small

B. Applied periodic force is small

C. Quality factor is small

D. Damping force is small

Answer: D

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11. Amplitude of a wave is represented by

$A\frac{c}{a+b+c}$ Then resonance will occur when

A. $b=-c/2$

B. b=0 and a =-c

C. b= -a/2

D. none of these

Answer: B

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12. A particle, with restoring force proportional to displacement and resulting force proportional to velocity is subjected to a force $F \sin \omega t$. If the amplitude of the particle is maximum for $\omega = \omega_1$, and the energy of the particle is maximum for $\omega = \omega_2$, then

A. $\omega_1 = \omega_0$ and $\omega_2 \neq \omega_0$

B. $\omega_1 = \omega_0$ and $\omega_2 = \omega_0$

C. $\omega_1 \neq \omega_0$ and $\omega_2 = \omega_0$

D. $\omega_1 \neq \omega_0$ and $\omega_2 \neq \omega_0$

Answer: C

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13. A simple pendulum is set into vibrations. The bob of the pendulum comes to rest after some time due t

A. Air friction

B. Moment of inertia

C. weight of the bob

D. Combination of all the above

Answer: A

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14. A simple pendulum oscillates in air with time period T and amplitude A . As the time passes

A. T and A both decrease

B. T increases and A is constant

C. T increases and A decreases

D. T decrases and A is constant

Answer: C

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Graphical Questions

1. A particle is executing SHM. Then the graph of acceleration as a function of displacement is

A. A straight line

B. A circle

C. An ellipse

D. A hyperbola

Answer: A

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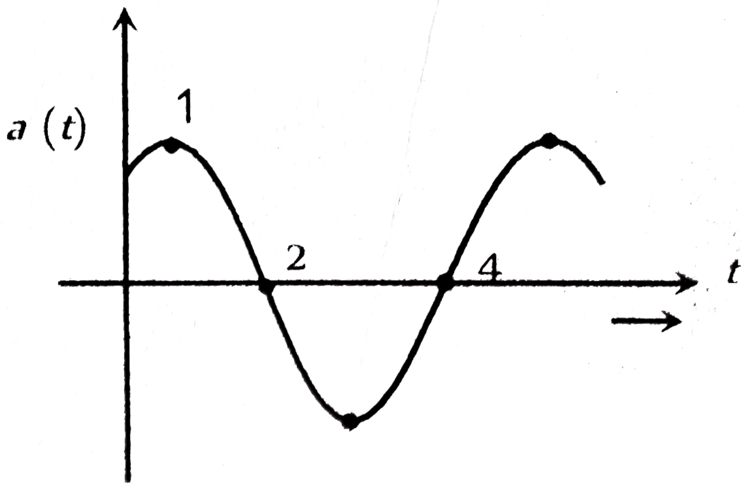
2. The acceleration a of a particle undergoing S.H.M. is shown in the figure. Which of the labelled points corresponds to the particle being at -x



A. 4

B. 3

C. 2

D. 1

Answer: D

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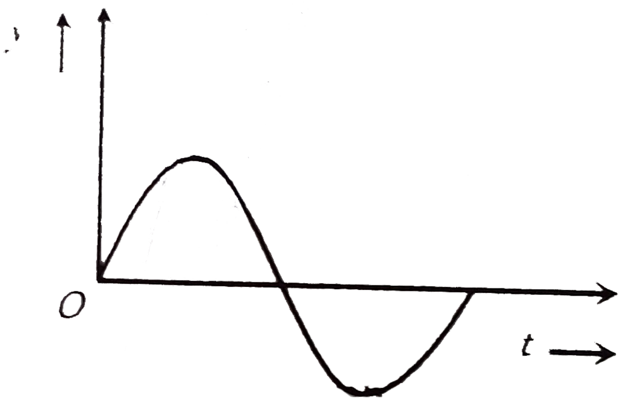
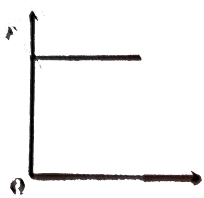
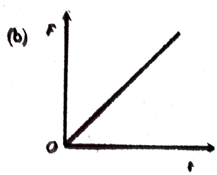
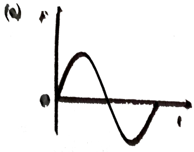
3. The displacement time graph of a particle executing S.H.M. is as shown in the figure

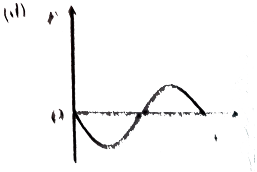
The corresponding force-time graph of the particle is



A. 

B. 

C. 

D. 

Answer: D

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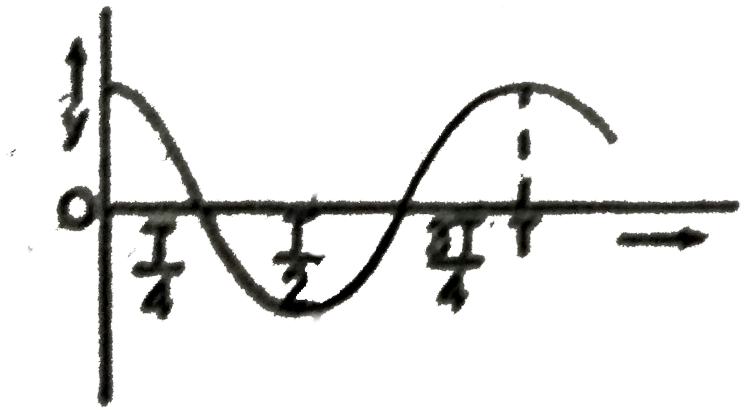
4. The displacement time graph of a particle executing S.H.M. (in straight line) is shown. Which of the following statements is true?



A. The force is zero at time 3T/4

B. The velocity is maximum at time t/2

C. the acceleration is maximum at time T

D. The P.E is equal to tatol energy at time T/2

Answer: D

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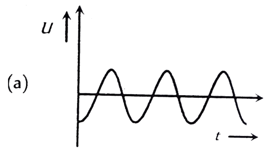
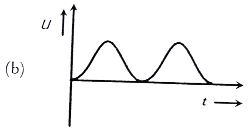
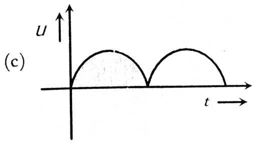
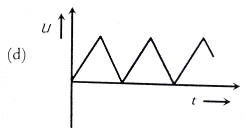
5. In S.H.M., potential energy (U) vs time (t) graph is

A. 

B. 

C. 

D. 

Answer: B

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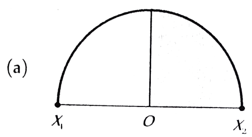
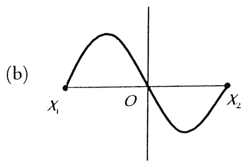
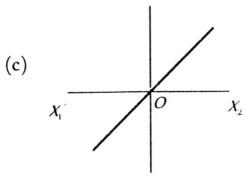
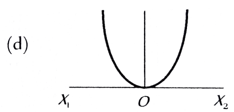
6. A particle of mass m oscillates with simple harmonic motion between points x_1 and x_2, the equilibrium position being O. Its potential energy is plotted. It will be as given below in the graph

A. 

B. 

C. 

D. 

Answer: D

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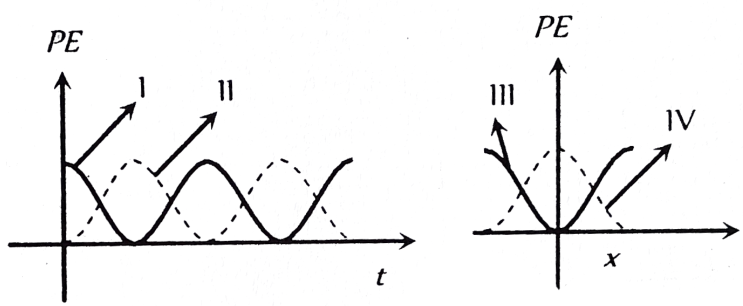
7. For a particle executing S.H.M. the displacement x is given by $x = A\cos\omega t$. Identify the graph which represents the variation of potential energy (P.E.) as a function of time



A. I,III

B. II, IV

C. II, III

D. I,IV

Answer: A

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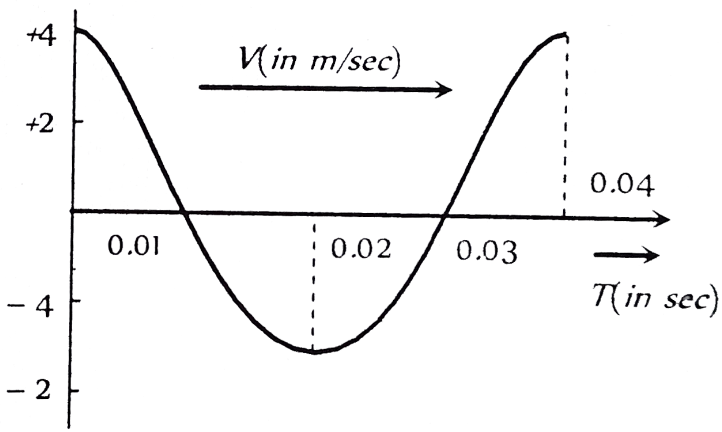
8. The velocity-time diagram of a harmonic oscillator is shown in the adjoining figure. The frequency of oscillation is



A. 25 Hz

B. 50 Hz

C. 12.25 Hz

D. 33.3 Hz

Answer: A

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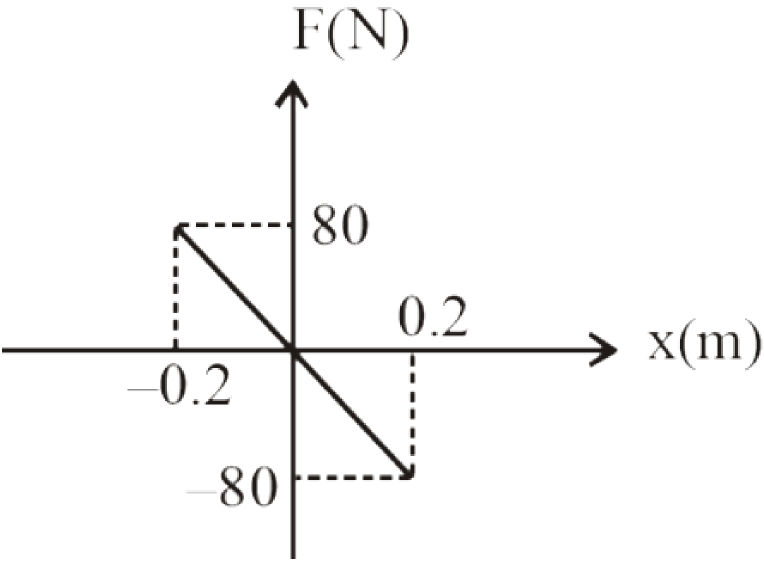
9. A body of mass 0.01 kg executes simple harmonic motion about x = 0 under the influence of a force as shown in figure. The time period of SHM is



A. 1.05 s

B. 0.52 s

C. 0.25 s

D. 0.30 s

Answer: D

10. For a simple pendulum the graph between length and time period will be

A. Hyperbola

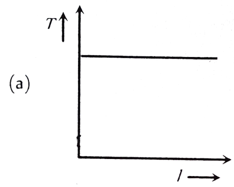
B. Parabola

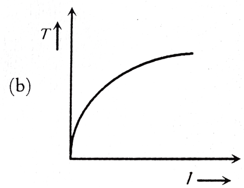
C. A curved line

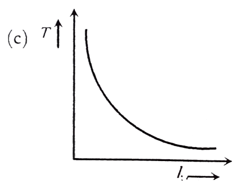
D. A straight line

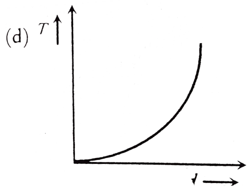
Answer: B

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

A. 

B. 

C. 

D. 

Answer: B

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12. Graph between velocity and displacement of a particle, executing S.H.M. is

A. A straight line

B. A parabola

C. A hyperbola

D. An ellipse

Answer: D

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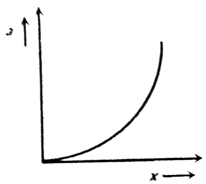
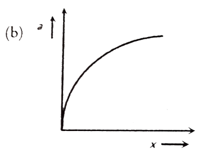
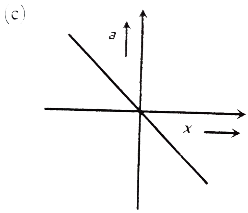
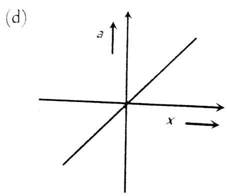
13. The variation of the acceleration (f) of the particle executing S.H.M. with its displacement (X) is represented by the curve

A. 

B. 

C. 

D. 

Answer: C

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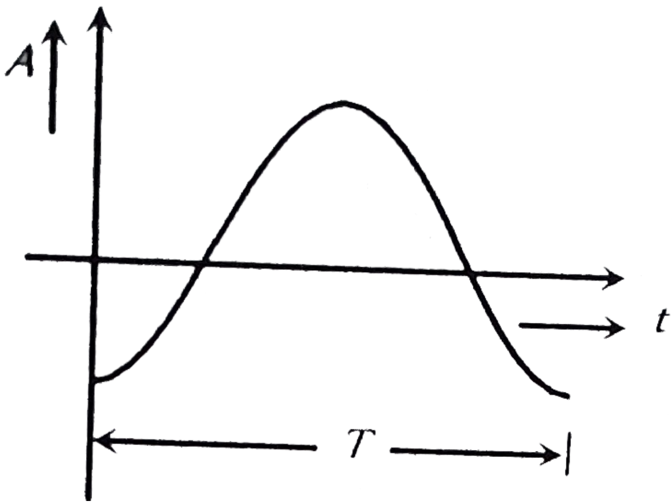
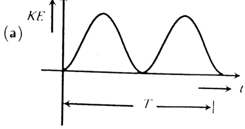
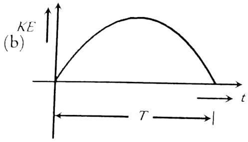
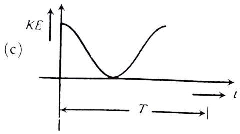
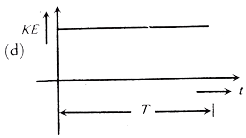
14. Acceleration A and time period T of a body in S.H.M. is given by a curve shown below. Then corresponding graph, between kinetic energy (K.E.) and time t is correctly represented by



A. 

B. 

C. 

D. 

Answer: A

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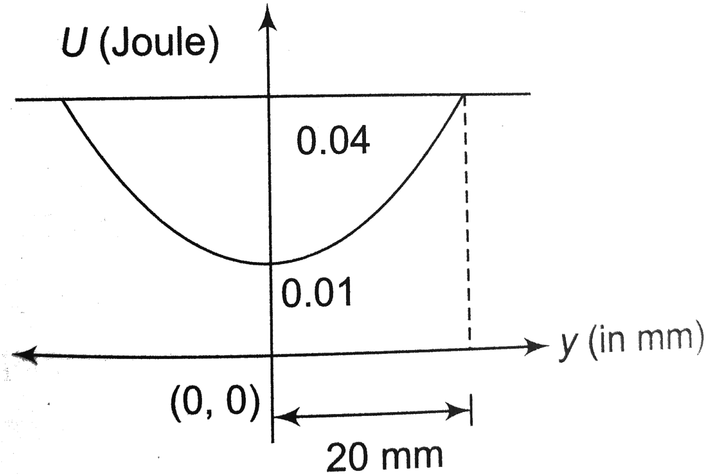
15. The variation of potential energy of harmonic oscillator is as shown in figure. The spring constant is



A. $1 \times 10^2 \dfrac{N}{m}$

B. 150N/m

C. $667 \times 10^2 N/m$

D. 3×10^2 N/m

Answer: B

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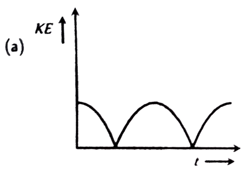
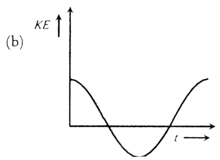
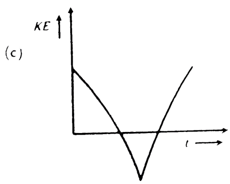
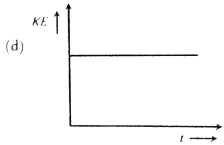
16. A body performs S.H.M. Its kinetic energy K varies with time t as indicated by graph

A. 

B. 

C. 

D. 

Answer: A

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Assertion Reason

1. Assertion : All oscillatory motions are necessarily periodic motion but all periodic motion are not oscillatory.

Reason : Simple pendulum is an example of oscillatory motion.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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2. 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 reason is the correct explanation of the assertion.

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer:

Watch Video Solution

3. Assertion : Acceleration is proportional to the displacement. This condition is not sufficient for motion in simple harmonic.

Reason : In simple harmonic motion direction of displacement is also considered.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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4. Assertion : Sine and cosine function are periodic function

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

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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5. Assertion : The graph 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 reason is the correct explanation of the assertion.

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true

Answer:

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6. 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 reason is the correct explanation of the

assertion.

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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7. 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 reason is the correct explanation of the assertion.

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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8. 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 reason is the correct explanation of the

assertion.

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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9. Assertion : The period change in time period is 1.5% if the length of simple pendulum increases by

3% .

Reason : Time period is dinesty proportional to length of pendulum.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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10. Assertion : The frequency of a second pendulum in an elevator moving up with an acceleration half the acceleration due to gravity is 0.612 s –1.

Reason : The frequency of a second pendulum does not depend upon acceleration due to gravity.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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11. Assertion : Damped vibrations indicate loss of energy

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

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

Answer: B

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12. Assertion: In a simple harmonic 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 reason is the correct explanation of the assertion.

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

assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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13. Statement I: If the amplitude of a simple harmonic oscillator is doubled, its total energy becomes four times.

Statement II: The total energy is directly proportional to the square of the amplitude of vibration of the harmonic oscillator.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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14. Assertion : For an oscillating simple pendulum, the tension in the string is maximum at the mean position and minimum at the extreme position. It brgt Reason : The velocity of oscillating bob in simple harmonic motion is maximum at the mean position.

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

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

assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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15. Assertion : The spring constant of a spring is k. When it is divided into n equal parts, then springconstant of one piece is k/n.

Reason : The spring constant is independent of material used for the spring.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true

Answer: D

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

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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17. Assertion : In extreme position of a particle executing S.H.M., both velocity and acceleration are zero.

Reason : In S.H.M., acceleration always acts towards mean position.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer:

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18. Assertion: soldiers are asked to break steps while crossing the bridge.

Reason: The frequency of marching may be equal to the natural frequency of bridge and may lead to resonance which can break the bridge.

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

Answer: A

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19. Assertion : The amplitude of oscillation can never be infinite. lt brgt Reason : The energy of oscillator is continuously dissipated.

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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20. Statement-1 : In S.H.M., the motion is 'to and fro' and periodic.

Statement-2 : Velocity of the particle

(v) $= \omega\sqrt{k^2 - x^2}$(where x is the displacement and k is amplitude)

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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21. 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 reason is the correct explanation of the assertion.

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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

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

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

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

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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

Reason : For simple harmonic motion acceleration must be proportional to displacement and is directed towards the mean position

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true

Answer:

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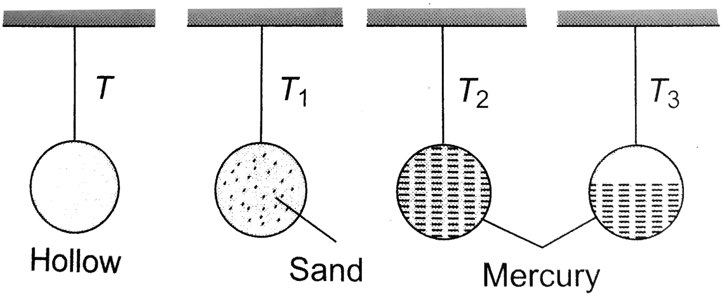
Simple Harmonic Motion

1. The period of a simple pendulum whose bob is hollow metallic sphere is T. The period is T_1 when 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. $T > T > T_1 = T_2$

D. $T = T_1 = T_2 < T_3$

Answer: D

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2. A pendulum clock thast keeps correct time on the earth is taken to the moon. It will run

A. At correct rate

B. 6 time faster

C. $\sqrt{6}$ times faster

D. $\sqrt{6}$ time slowly

Answer: D

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3. A pendulum has time period T in air when it is made to oscillate in water it acquired a time period

$T = \sqrt{2}T$ 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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4. An object of mass $0.2kg$ executes simple harmonic oscillation along the $x - a\xi s$with a frequency of

$(25/\pi)Hz$. At the position $x = 0.04$, the object has Kinetic energy of $0.5J$ and potential energy `0.4 J. The amplitude of oscillations is......m.

A. 0.05

B. 0.06

C. 0.01

D. none of these

Answer: B

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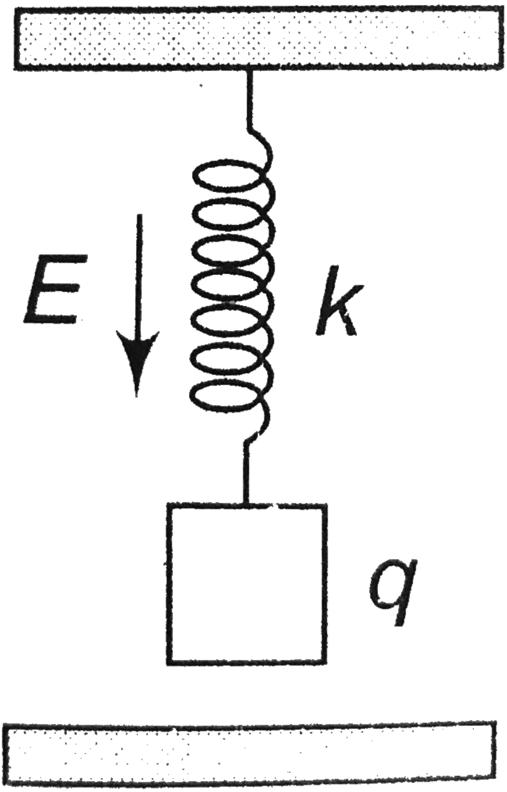
5. Time period of a block when suspended from the upper plate of a parallel plate capactor by a spring of stiffness k is when block ids unchanged If a change g is given to the block then new time period of oscilation will be



A. T

B. $> T$

C. $< T$

D. $\geq T$

Answer: A

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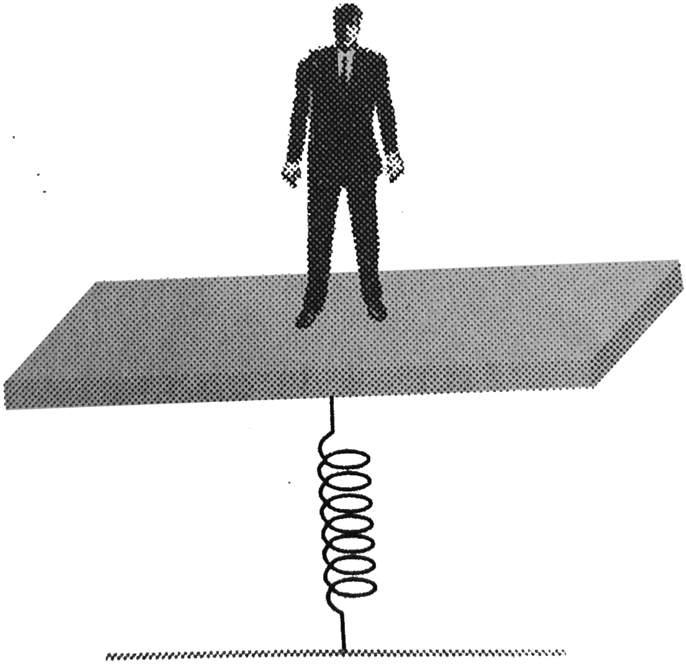
6. A man weighing $60kg$ stands on the horizontal platform of a spring balance. The platform starts executing simple harmonic motion of amplitude $0.1m$ and frequency $\frac{2}{\pi}$. its which of the following statement is correct ?



A. The spring balance reads the weight of man as

60 kg

B. The spring balance reading fluctuates between

60 kg . and 70 kg

C. The spring balance reading fluctuates between 50 kg and 60 kg

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

Answer: D

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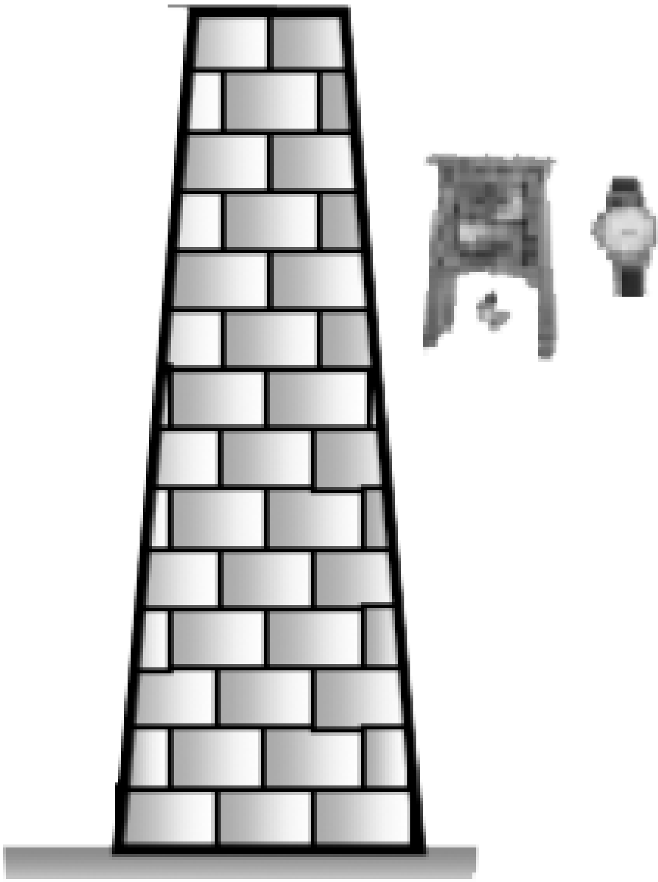
7. A man having a wrist watch and a pendulum clock rises on a TV tower. The wrist watch and pendulum clock per chance fall from the top of the tower. Then



A. Both will keep correct time during the fall.

B. Both will keep incorrect time during the fall.

C. Wrist watch will keep correct time and clock will become fast

D. Clock will stop but wrist watch will function normally.

Answer: D

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8. A force of 6.4 N stretches a vertical spring by 0.1 m. The mass (in kg) that must be suspended from the spring so that it oscillates with a time period of $\frac{\pi}{4}$ second.

A. $\left(\frac{\pi}{4}\right)$ kg

B. 1 kg

C. $\left(\frac{1}{\pi}\right)$

D. 10b kg

Answer: B

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9. A spring with 10 coils has spring constant k. It is exactly cut into two halves, then each of these new springs will have a spring constant

A. K/2

B. 3k/2

C. 2k

D. 3 k

Answer: B

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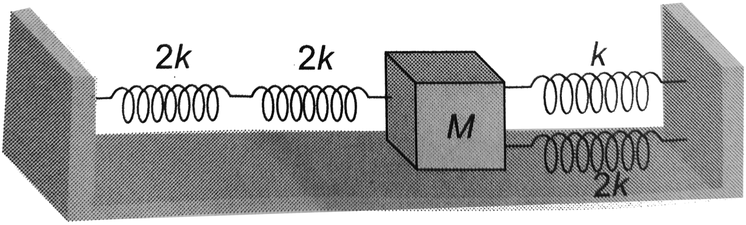
10. Four mass less spring whose force constant are $2k, 2k, k$ and $2k$ respectively are attached to a mass M kept on a friction less plate (as shown in figure) if the mass M is displaced in the horizontal direction then the frequency of oscillation of the system is



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

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

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

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

Answer: B

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11. 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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12. Two simple pendulums have time periods T and $5T/4$. They start vibrating at the same instant from the mean position in the same phase. The phase difference between them when the pendulum with higher time period complets one oscillation is

A. 45°

B. 90°

C. 60°

D. 30°

Answer: B

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13. The periodic time of a particle doing simple harmonic motion is 4 second . The time taken by it to go from its mean position to half the maximum displacement (amplitude) is

A. 2s

B. 1s

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

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

Answer: D

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14. 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. Non-periodic

C. Simple harmonic motion with period 0.1 s

D. Simple harmonic motion with period 0.2 s

Answer: C

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15. 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. sqrt3/2`

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

D. $\sqrt{2}$

Answer: A

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16. Two simple pendulums of lengths 1.44 m and 1 m start swinging together. After how many vibrations will they again start swinging together

A. 5 oscillations of smaller pendulum

B. 6 oscillations of smaller pendulum

C. 4 oscillations of bigger pendulum

D. 6 oscillations of bigger pendulum

Answer: B

17. 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

A. 1

B. 2

C. 0.5

D. $\sqrt{2}$

Answer: D

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18. A particle doing simple harmonic motion amplitude $= 4cm$ time period $= 12\sec$ The ratio between time taken by it in going from its mean position to $2cm$ and from $2cm$ to extreme position is

A. 1

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

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

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

Answer: D

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19. On a planet a freely falling body takes 2 sec when it is dropped from a height of 8 m , the time period of simple pendulum of length 1 m on that planet is

A. 3.14 sec

B. 16.28 sec

C. 1.57 sec

D. none of these

Answer: A

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20. If a simple pendulum is taken to place where g decreases by 2%, then the time period

A. Decreases by 1%

B. Increases by 2%

C. Increases by 2%

D. Increases by 1%

Answer: D

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21. 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 the vibrational energy of both is same which is correct?

A. Amlitude of B greater than A

B. Amplitude of B smaller than A

C. Amplitude will be same

D. None of these

Answer: B

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