PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

OSCILLATIONS

Mcq Level I

1. A particle of mass m is executing S.H.M. about a point with amplitude 10 cm. Its maximum velocity is 100 cm s^{-1}. Its velocity will be 50 cm s^{-1} at a distance :

A. 5 cm

B. $5\sqrt{2}$ cm

C. $5\sqrt{3}$ cm

D. $\dfrac{10}{\sqrt{2}}$ cm.

Answer: C

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2. A.S.H.M. oscillator has period of 0.1 s and amplitude of 0.2 m. The maximum velocity is given by :

A. $100 \ \mathrm{m\,s}^{-1}$

B. $4\pi \ \mathrm{m\,s}^{-1}$

C. $100\pi \ \mathrm{m\,s}^{-1}$

D. $20\pi \ \mathrm{m\,s}^{-1}$

Answer: B

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3. If a hole is drilled along the diameter of the earth and a stone is dropped into it. The stone :

A. reaches the centre of earth and stops

B. reaches the opposite end and stops

C. executes S.H.M. about the centre of earth

D. reaches the opposite side and escapes earth.

Answer: C

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4. A pendulum is first vibrated on the surface of earth. Its period is T. It is then taken to the surface of moon where acceleration due to gravity is 1/6th of that on earth. Its period will be :

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

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

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

D. $T\sqrt{6}$

Answer: D

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5. The angular frequency of a pendulum is ω rad s^{-1}. If the length is made one fourth of the original length, the angular frequency becomes :

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

B. 2ω

C. 4ω

D. $\omega/4$

Answer: B

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6. A simple pendulum has a pariod T inside a lift when it is stationary. The lift is accelerated upwards with constant acceleration 'a'. The period :

A. decreases

B. increases

C. remains same

D. sometimes increases and sometimes decreases.

Answer: A

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7. A simple pendulum is suspended vertically to the ceiling of compartment in a stationary train. If the 'train' is constantly accelerated by acceleration 'a' the angle θ which string makes with vertical is :

A. zero

B. $\tan^{-1}\frac{a}{g}$

C. $\sin^{-1}\frac{a}{g}$

D. $\cos^{-1}\frac{a}{gg}$

Answer: B

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8. An object attached to a light spring oscillates in S.H.M. on horizontal smooth surface. The ratio of maximum P.E. to maximum K.E. is :

A. $1/2$

B. 2

C. 1

D. $\sqrt{3}/2$

Answer: C

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9. A girl swinging on a swing in sitting position suddenly stands up. The period of swing then will be :

A. increased

B. decreased

C. the same

D. none of these.

Answer: B

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10. The equation of mation for a body executing S.H.M. is given by $y = 1.5 \sin(10\pi t + 5)$. The frequency is given by :

A. 5 Hz

B. 10 Hz

C. 2.5 Hz

D. 5π Hz

Answer: A

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11. The length of the second's pendulum is increased by 0.1%. The clock :

A. gains 43.2 s per day

B. loses 43.2 s per day

C. neither loses nor gains time

D. none of the above.

Answer: B

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12. The maximum acceleration of a body moving in S.H.M. is a_0 and maximum velocity is v_0. The amplitude is given by :

A. $\frac{v_0^2}{a_0}$

B. $\frac{a_0^2}{v_0}$

C. $a_0 . v_0$

D. $\dfrac{1}{a_0 . v_0}$

Answer: A

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13. The kinetic energy and potential energy of a particle executing simple harmonic motion will be equal when its displacement is : (amplitude = a) :

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

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

C. $a\sqrt{2}$

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

Answer: B

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14. Lissajou's figure obtained by combining x = A $\sin oemgat$ and $y = A\sin(\omega t + \pi/4)$ will be :

A. an ellipse

B. a circle

C. a straight line

D. a parabola

Answer: A

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15. The motion of 10 g mass tied to massless spring is represented by S.H.M.

$x = 25\cos\left(3t + \frac{\pi}{4}\right)$ where x is in cm and t in second, the force constant of the spring is :

A. 9 N m^{-1}

B. 0.9 N m^{-1}

C. 0.09 N m^{-1}

D. none of the above.

Answer: C

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16. A pendulum bob has a period 24 s. Its velocity 4 s after it has passed the mean position is $6.28 \ \mathrm{cm\,s^{-1}}$. The amplitude of its motion is :

A. 12 cm

B. 24 cm

C. 48 cm

D. 40 cm

Answer: C

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17. Two pendulums oscillate in S.H.M. with a constant phase difference $\frac{\pi}{2}$ but with same amplitudes. The maximum velocity of one is v, the maximum velocity of other will be :

A. v

B. 2 v

C. $\sqrt{2}v$

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

Answer: A

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18. The potential energy of particle moving is S.H.M. is $\frac{1}{2}kx^2$. If the frequency of the particle is n, the frequency of oscillation of P.E. is :

A. n

B. 2n

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

D. $n\sqrt{2}$.

Answer: B

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19. A mass of 1 kg is suspended from a spring and has a time period T on the surface of earth. The period at the centre of earth is :

A. zero

B. T

C. 2 T

D. infinite.

Answer: B

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20. If the length of second's pendulum is increased by 2%, how many seconds it loses per day ?

A. 3927 s

B. 1728 s

C. 3427 s

D. 864 s.

Answer: D

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21. A small body of mass 0.1 kg is undergoing S.H.M. of amplitude 1 metre and period 0.2 s. The maximum force acting on it is nearly :

A. 99 N

B. 9.9 N

C. 0.99 N

D. 990 N

Answer: A

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22. A body of mass 1 kg is executing S.H.M. given by $x = 6\cos(100t + \pi/4)$ cm, what is its maximum K.E. ?

A. 18 J

B. 36 J

C. 180 J

D. 1.8 J

Answer: A

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23. A simple pendulum executing S.H.M. has period T and amplitude A. Its speed, when at a distance $\frac{A}{4}$ is :

A. $\frac{\pi A\sqrt{15}}{2T}$

B. $\frac{\pi A\sqrt{15}}{T}$

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

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

Answer: A

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24. A simple harmonic oscillator has an amplitude A and time period T, the time required by it to travel from x = A to $x = \frac{A}{2}$ is :

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

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

C. $\frac{5T}{7}$

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

Answer: A

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25. Two pendulums have time periods T and $\frac{5T}{4}$. They start swinging in S.H.M. together. What will be the phase difference between them after the longer has completed one oscillation ?

A. 45°

B. 90°

C. 60°

D. 30°

Answer: B

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

A. zero

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

C. 4 s

D. infinite.

Answer: D

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27. A particle executes S.H.M. with amplitude 2 cm. At extreme position the force is 4 N. The force acting on it at a position mid-way between the mean and extreme is :

A. 1 N

B. 2 N

C. 3 N

D. 4 N

Answer: B

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28. A horizontal platform executes up and down S.H.M. about a mean position. Its period is 2π s. A mass m is resting on the platform, what is the greatest value of amplitude so that the mass 'm' may not leave the platform ?

A. 4.9 m

B. 9.8 m

C. 2.25 m

D. 19.6 m

Answer: B

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29. A body of 5 kg hangs from a spring and oscillates with a time period of 2π s. If the body is removed, the length of the spring will decrease by :

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

B. g metre

C. $\frac{g}{k}$ metre

D. none of these.

Answer: B

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30. A block of mass m rests on a platform. The platform is given up and down S.H.M. with an amplitude d. What can be the maximum frequency so that the block never leaves the platform ?

A. $\sqrt{g/d}$

B. $\frac{1}{2\pi}\sqrt{\frac{g}{d}}$

C. $\frac{1}{2\pi}\left(\frac{g}{d}\right)$

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

Answer: B

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31. A spring of force constant k is cut into three equal parts, which are joined in parallel to each other. The force constant of the combination will be :

A. k

B. 3 k

C. 9 k

D. k/3.

Answer: C

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32. The velocity -time graph of harmonic oscillator is shown in the given figure. The frequency of oscillation is :

A. 25 Hz

B. 50 Hz

C. 12.25 Hz

D. none of these.

Answer: A

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33. The period of oscillation of the mass m suspended by a massless spring, when slightly displaced and let go, is T. The period will be more than T if :

A. The above experiment is performed on the moon

B. The above experiment is performed in a mine

C. The mass m is increased

D. The mass m is decreased.

Answer: C

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34. The maximum speed of a particle executing an S.H.M. is $1\ \mathrm{m\,s^{-1}}$ and maximum acceleration is $1.57\ \mathrm{m\,s^{-2}}$. The time period of S.H.M. is :

A. 0.25 s

B. 4.00 s

C. 1.57 s

D. $\frac{1}{1.57}s.$

Answer: B

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35. A particle undergoes S.H.M. having time period T. The time taken in $\frac{3}{8}$ th oscillation is :

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

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

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

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

Answer: C

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36. A body executes S.H.M. with an amplitude A. At what displacement from the mean position is the potential energy of the body is one-fourth of its total energy ?

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

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

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

D. some other fraction of A.

Answer: B

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37. A particle of mass 0.1 kg is executing S.H.M. with amplitude 0.1 m. At the mean position its K.E. is 8×10^{-3} J. If the intial phase is 45°. What is the equation of its motion ?

A. $y = 0.1 \sin(4t)$

B. $y = 0.1 \sin \pi t$

C. $y = 0.1 \sin\left[4t + \frac{\pi}{4}\right]$

D. $y = 0.1 \sin\left[4t - \frac{\pi}{4}\right]$.

Answer: B

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38. For a particle executing simple harmonic motion, the kinetic energy K is given by,

$$K = K_0 \cos^2 \omega t$$

The maximum value of potential energy is :

A. K_0

B. $zero$

C. $K_0 / 2$

D. not obtainable

Answer: A

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39. The bob of simple pendulum of length L is released at time t = 0 from a position of small angular displacement θ. Its linear displacement at time t is given by :

A. $x = \theta o \sin 2\pi \sqrt{\frac{L}{g}} \times t$

B. $x = L\theta o \cos 2\pi \sqrt{\frac{g}{L}} \times t$

C. $x = L\theta o \sin \sqrt{\frac{g}{L}} \times t$

D. $x = L\theta o \cos \sqrt{\frac{g}{L}} \times t.$

Answer: D

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40. The kinetic energy of a particle, executing S.H.M., is 16 J when it is in its mean position. If the amplitude of oscillation is 25 cm, and the mass of the particle is 5.12 kg, the time period of its oscillations is :

A. $\pi/5$ s

B. 2π s

C. 20π s

D. 5π s.

Answer: A

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

A. 0.1

B. 0.21

C. 0.3

D. 0.5

Answer: A

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42. An instantaneous displacement of a simple harmonic oscillator is $x = A\cos(\omega t + \pi / 4)$. Its speed will be maximum at time :

A. $\pi / 4\omega$

B. π / ω

C. $\pi / 2\omega$

D. $2\pi / \omega$.

Answer: A

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43. A child is sitting on a swing. Its minimum and maximum heights from the ground are 0.75 m and 2m respectively. Its maximum speed will be :

A. 10 m/s

B. 8 m/s

C. 5 m/s

D. 15 m/s

Answer: C

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44. A particle of mass m, oscillates with SHM between points x_1 and x_2, the equilibrium position being O. Its P.E. is plotted. It will be as given below in the graph.

A.

B.

C.

D.

Answer: A

45. A weightless spring of length 60 cm and force constant $100 \ \mathrm{Nm}^{-1}$ 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. $\frac{\pi}{5} s$

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

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

Answer: A

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46. A particle executes S.H.M. with an amplitude of 2 cm. When the particle is at 1 cm from the mean position the magnitude of tis velocity is equal to that of its acceleration. Then its time period in second is :

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

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

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

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

Answer: C

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47. Two springs A and B having spring constant k_A and $k_B(k_A = 2k_B)$ are stretched by applying force of equal magnitude. If energy stored in spring A is E_A then energy stored in B will be :

A. $2E_A$

B. $E_A/4$

C. $E_A/2$

D. $4E_A$.

Answer: A

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48. When the kinetic energy of the body executing SHM is 1/3 of the potential energy, the displacement of the body is x% of the amplitude, where x is :

A. 33

B. 67

C. 87

D. 50

Answer: C

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49. A rectangular block of mass m and area of cross-section A floats in a liquid of density ρ. If it is given a small vertical displacement from equilibrium it undergoes oscillation with a time period T. Then :

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

B. $T \propto \sqrt{\rho}$

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

D. $T \propto \frac{1}{\rho}$.

Answer: C

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50. A bodyy executes simple harmonic motion. The potential energy (P.E.), the kinetic energy (K.E.) and total energy (T.E.) are measured as a function of displacement X. Which of the following statements is true ?

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

B. T.E. is zero when X = 0

C. K.E. is maximum when X is maximum

D. P.E. is maximum when X = 0

Answer: A

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51. The total energy of a particle, executing S.H.M. is :

A. $\propto X$

B. $\propto X^{1/2}$

C. independent of X

D. $\propto X^2$ where X is the displacement from the mean position

Answer: C

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

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

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

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

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

Answer: B

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53. If a simple harmonic motion is represented by $\frac{d^2X}{dt^2} + \alpha x = 0$ its time period is :

A. $2\pi / \alpha$

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

C. $2\pi\alpha$

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

Answer: B

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54. The bob of a simple pendulum is a spherical hollow ball filled with water. A plugged hole near the bottom of the oscillating bob gets suddenly unplugged. During observation,till water is coming out, the time period of oscillation would :

A. first increase and then decrease to the original value

B. first decrease and then increase to the original value

C. remain unchanged

D. increase towards a saturation value

Answer: A

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55. The maximum velocity of a particle executing simple harmonic motion with an amplitude 7 mm is 4.4 m/s. The period of oscillation is :

A. 0.01 s

B. 10 s

C. 0.1 s

D. 100 s.

Answer: A

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

A. at the mean position of platform

B. for an amplitude g/ω^2

C. for an amplitude of g^2/ω^2

D. at the highest position of the platform.

Answer: D

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57. A mass hangs at the end of a massless spring and oscillates up and down at its natural frequency f. If the spring is cut at the midpoint and and mass reattached at the end, the frequency of oscillation is :

A. $\sqrt{2}f$

B. $2\sqrt{2}$

C. $f\,/\,2$

D. $f\sqrt{2}.$

Answer: A

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58. Two particles are executing simple harmonic motion. At an instant of time t their displacement are

$y_1 = a\cos(\omega t)$

and $y_2 = a\sin(\omega t)$

Then the phase difference between y_1 and y_2 is:

A. 120°

B. 90°

C. 180°

D. zero.

Answer: B

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59. Displacement between maximum potential energy position and maximum kinetic energy position for a particle executing S.H.M. is :

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

B. $\pm a$

C. $+1$

D. -1

Answer: B

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60. The ratio of kinetic energy of mean position to thhe potential energy when the displacement is half of the amplitude is :

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

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

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

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

Answer: A

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61. The equation of a simple harmonic motion

is $\pi = 0.34\cos(3000t + 0.74)$ where x and t are in mm and s respectively. The frequency of the motion is :

A. 3000

B. $0.74 / 2\pi$

C. $\frac{3000}{2}\pi$

D. $3000 / \pi$.

Answer: C

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62. A lift is ascending by acceleration $g/3$. What will be the time period of a simple pendulum suspended from its ceiling if its time period in stationary lift is T?

A. $T/2$

B. $\left(\sqrt{3/4}\right)T$

C. $T/4$

D. $\left(\sqrt{3/2}\right)T$.

Answer: B

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63. A pendulum suspended from ceiling of a train has a time period T, when the train is at rest. When the train is accelerating with uniform acceleration 'a', the period of oscillation will

A. Decrease

B. Increase

C. Remains unaffected

D. Becomes infinite.

Answer: A

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64. Period of oscillation of mass attached to a spring and performing S.H.M. is T. The spring is now cut into four equal pieces and the same mass attached to one piece. Now the period of its simple harmonic oscillation is :

A. 2T

B. T/2

C. T

D. T/4

Answer: B

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65. In case of a forced vibrations, the resonance wave becomes very sharp when the :

A. damping force is small

B. applied periodic force is small

C. restoring force is small

D. qiality factor is small.

Answer: A

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66. Pendulum after some time becomes slow in motion and finally slopes due to :

A. air friction

B. mass of pendulum

C. earth's gravity

D. none of these.

Answer: A

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67. The resultat of two rectangular simple harmonic motions of the same frequency and unequal amplitudes but differing in phase by $\frac{\pi}{2}$ is :

A. simple harmonic

B. circular

C. elliptical

D. parabolic.

Answer: B

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68. The period of oscillation of a simple pendulum is T in a stationary lift. If the lift moves upward with acceleration of 8g the time period will :

A. becomes T/2

B. becomes T/3

C. remains same

D. none of these.

Answer: B

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

A. $\frac{K_0}{2}$ and K_0

B. K_0 and $2K_0$

C. K_0 and K_0

D. 0 and $2K_0$.

Answer: C

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70. A simple pendulum performs simple harmonic motion about x = 0 with an amplitude a and time period T.

The speed of the pendulum at $x = \frac{a}{2}$ will be :

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

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

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

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

Answer: C

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71. The period of oscillation of a mass M suspended from a spring of negligible mass is T. If along with it another mass M is also suspended, the period of oscillation will now be :

A. $2T$

B. $\sqrt{2}T$

C. T

D. $T/\sqrt{2}$

Answer: B

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Mcq Level Ii

1. A pendulum suspended from ceiling of a train has a time period T, when the train is at rest. When the train is accelerating with uniform acceleration 'a', the period of oscillation will

A. increase

B. decrease

C. remain the same

D. become infinite.

Answer: B

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2. A mass m is suspended to a spring of length L and force constant k. The frequency of vibration is v. The spring is cut into two equal parts and each half is loaded with same mass m. The new frequency v' is given by :

A. $v' = \sqrt{2}v$

B. $v' = \frac{v}{\sqrt{2}}$

C. $v' = 2v$

D. $v' = 4v.$

Answer: A

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3. A particle is executing S.H.M., with the length of its path as as 8 cm. At what displacement from the mean position half the energy is kinetic and half is potential ?

A. At 2 cm

B. At $2\sqrt{2}$ cm

C. At $\sqrt{2}$ cm

D. At 4 cm.

Answer: B

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4. Two weightless springs have force constants k_1 and k_2 and connected in series. The combination is loaded with m, the time period of oscillation is :

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

B. $T = 2\pi\sqrt{m\left(\dfrac{1}{k_1} + \dfrac{1}{k_2}\right)}$

C. $T = 2\pi\sqrt{\dfrac{\mathrm{m\,k}_1 k_2}{k_1 + k_2}}$

D. none of these.

Answer: B

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5. A body is executing S.H.M. with period 12 s. The time it takes in traversing a distance equal to half its amplitude is :

A. 6 s

B. 9 s

C. 3 s

D. 1 s

Answer: D

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6. A sphere of brass is suspended to a vertical spring and oscillates with frequency f'. The ball is now immersed is non-viscous liquid whose density is $\frac{1}{10}$ th of density of brass. If the sphere remains vibrating in the liquid the frequency f now will be :

A. $f' = f$

B. $f' = \sqrt{\frac{10}{9}}f$

C. $f' = \sqrt{\frac{10}{9}}f$

D. $f' = \sqrt{\frac{9}{10}}f.$

Answer: A

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7. A U-tube contains a non-viscous liquid up to a height of 20 cm in each of the column. It is pressed in one of the columns and then released. The liquid executes a S.H.M. of period :

A. 0.89 s

B. 2.89 s

C. 2.13 s

D. none of the above.

Answer: A

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8. A mass M is suspended from a light spring. An additional mass m added displaces the spring further by a distance x. Now the combined mass will oscillate on the spring with a period :

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

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

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

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

Answer: B

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9. In arrangement shown in Fig., if the block of mass 'm' is displaced and then released the frequency of oscillation is given by :

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

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

C. $v = \frac{1}{2\pi}\sqrt{\frac{m}{k_1 - k_2}}$

D. $v = \frac{1}{2\pi}\sqrt{\frac{m}{k_1 + k_2}}$

Answer: B

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10. A particle executes S.H.M. with an amplitude of 2 cm. When the particle is at 1 cm from the mean position the magnitude of tis velocity is equal to that of its acceleration. Then its time period in second is :

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

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

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

D. $\frac{1}{2\pi\sqrt{3}}s.$

Answer: B

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11. A S.H.M. is given by $y = 5\left[\sin(3\pi t) + \sqrt{3}\cos(3\pi t)\right]$. What is the amplitude of the motion if y is in metres ?

A. 2 m

B. 5 m

C. 4 m

D. 10 m.

Answer: D

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12. A mass 'M' is suspended from a spring of negligible mass. The spring is pulled a little and then released. It execuutes S.H. oscillations of period T. When mass is increased by 'm', the period becomes $\frac{5}{4}$ T, the ratio $\frac{m}{M}$ is :

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

B. $\frac{25}{16}$

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

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

Answer: A

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13. A simple pendulum having length l cm and mass mg is suspended between two plates having a uniform electric field E as shown. The bob is given a charge of q coulombs. The time period T of its vibration is :

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

B. $2\pi\sqrt{\dfrac{l}{g-\dfrac{Eq}{m}}}$

C. $2\pi\sqrt{\dfrac{l}{g+\dfrac{Eq}{m}}}$

D. $2\pi\sqrt{\dfrac{l}{\left[g^2+\left(\frac{Eq^2}{m}\right)\right]^{1/2}}}$.

Answer: C

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14. In the above question, if the direction of the field is reversed and is from B to A and $g > \dfrac{Eq}{m}$, then the period is :

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

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

C. $2\pi\sqrt{\frac{l}{\left[g^2+\left(\frac{Eq^2}{m}\right)\right]^{1/2}}}$

D.

Answer: B

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15. A body executes S.H.M. under the influence of one force and has a period T_1 second and the same body executes S.H.M. with period T_2 second when under the influence of another force. When both forces act simultaneously and in the same direction, then the time period of the same body is :

A. $(T_1 + T_2)s$

B. $\sqrt{T_1^2 + T_2^2} s$

C. $\sqrt{\frac{T_1^2 + T_2^2}{T_1 T_2}} s$

D. $\sqrt{\frac{T_1^2 T_2^2}{(T_1^2 + T_2^2)}} s.$

Answer: D

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16. A mass m is suspended to a spring of length L and force constant k. The frequency of vibration is v. The spring is cut into two equal parts and each half is loaded with same mass m. The new frequency v' is given by :

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

B. $f_2 = \frac{f_1}{\sqrt{2}}$

C. $f_2 = f_1 / 2$

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

Answer: A

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17. Two bodies A and B of mass 1 kg and 2 kg are soldered to two ends of vertical spring of force constant 400 N/m. A being at the upper end and B resting on a table. A is now compressed and then released. The freq. of osillation is :

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

B. 10π Hz

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

D. None of these.

Answer: A

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18. Energy is constantly fed to a spring oscillator of force constant $225\pi^2 \text{ Nm}^{-1}$ and attached mass 0.01 kg at a frequency of 50 cycles per s. Will the resonance be achieved ?

A. Yes

B. No

C. Sometimes only

D. After a long time only.

Answer: B

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19. The time period of pendulum at temperature $t_1^\circ C$ is T_1 s. Its time period at $t_2^\circ C$ is T_2 s. If coefficient of linear expansion of material of pendulum is α, then increase in time period is :

A. $\alpha(t_2 - t_1)$

B. $\frac{\alpha(t_2 - t_1)}{2}$

C. $\frac{\alpha(t_2 - t_1)}{3}$

D. None of these.

Answer: B

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20. If the potential energy of a harmonic oscillator in its resting position is 500 erg and total energy is 1500 erg when the amplitude is 5 cm what is the force constant if its mass is 200 gm ?

A. 40 dyne/cm

B. 60 dyne/cm

C. 80 dyne/cm

D. 120 dyne/cm.

Answer: C

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21. A particle starts S.H.M. from the mean position as shown in the Fig. below. Its amplitude is A and its time period is T. At one time its speed is half that of the maximum speed. What is this displacement ?

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

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

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

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

Answer: B

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22. A simple pendulum oscillates in a verticle plane. When it passes through the mean position,the tension in the string is 3 times the weight of the pendulum bob. What is the maximum angular displacement of the pendulum of the string with respect to the vertical ?

A. 30°

B. 60°

C. 45°

D. 90°

Answer: D

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23. When an oscillator completes 100 oscillations its amplitude reduces to $\frac{1}{3}$ of its initial value. What will be its amplitude, when it completes 200 oscillations ?

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

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

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

D. $\frac{1}{9}$.

Answer: D

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24. The time period of a particle in simple harmonic motion is 8 second. At t = 0 it is at the mean position. The ratio of the distances travelled by it in the first and second is :

A. $1/2$

B. $1/\left(\sqrt{2}-1\right)$

C. $1/\sqrt{2}$

D. $1/\sqrt{3}$.

Answer: B

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25. Statement-I : In simple harmonic motion, the motion is 'to and fro' and periodic.

Statement-II : Velocity of particle is $v = w\sqrt{r^2 - x^2}$ where x is displacement and r is amplitude.

A. Statement-I is true, Statement-II is true and

Statement-II is correct explanation for Statement-I.

B. Statement-I is true, Statement-I is true and Statement-II is correct explanation for Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement-II is false.

Answer: B

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26. Statement-I : Resonance is a special case of forced vibrations in which frequency and nature of vibration of the body is same as the impressed frequency and amplitude of forced vibration is maximum.

Statement-II : The amplitude of forced vibration of a body increases with an increase in the frequency of the externally applied periodic force.

A. Statement-I is true, Statement-II is true

and

Statement-II is correct explanation for

Statement-I.

B. Statement-I is true, Statement-I is true

and

Statement-II is correct explanation for

Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement-II is false.

Answer: B

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27. Statement-I : In S.H.M., the velocity is maximum when acceleration is minimum.

Statement-II : Displacement and velocity of S.H.M. differ in phase by $\pi/2$.

A. Statement-I is true, Statement-II is true and

Statement-II is correct explanation for Statement-I.

B. Statement-I is true, Statement-I is true and Statement-II is correct explanation for Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement-II is false.

Answer: B

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28. Statement-I : Energy of a particle excuting simple harmonic motion is entirely potenital energy at the extreme possition.

Statement-II : Particle at extreme position is at rest.

A. Statement-I is true, Statement-II is true and Statement-II is correct explanation for Statement-I.

B. Statement-I is true, Statement-I is true and Statement-II is correct explanation for Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement-II is false.

Answer: A

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29. Statement-I : The time period of a simple pendulum on a setellite orbiting the earth is infinite.

Statement-II : The time period of a satellite

$$T \propto \frac{1}{g}$$

A. Statement-I is true, Statement-II is true and Statement-II is correct explanation for Statement-I.

B. Statement-I is true, Statement-I is true and Statement-II is correct explanation for Statement-I.

C. Statement-I is true, Statement-II is false.

D. Statement-I is false, Statement-II is false.

Answer: A

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30. Paragraph : Two blocks A and B each of mass m are connected by springs each of spring constant K is shown in figure beloe :

If mass A is displaced to the left and mass B is displaced to the right by same distance and released.

The time period of oscillation is

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

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

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

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

Answer: D

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31. Paragraph : Two blocks A and B each of mass m are connected by springs each of spring constant K is shown in figure beloe :

If mass A is displaced to the left and mass B is displaced to the right by same distance and released.

If two masses A and B joined together are pushed towards right by same distance and then released then frequency of oscillation of combined mass is :

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

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

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

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

Answer: A

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32. Paragraph : A scientist was asked to find the height of the roof of a dome shaped hall. He took a spherical ball of radius 20 cm which he suspend with the string from the roof of dome. The height of the ball above the ground was 5 cm when suspended. He noted the time of 20 oscillations to be 100 s.

The time period of the pendulum when suspended from roof is :

A. 5 s

B. 10 s

C. 20 s

D. 100 s.

Answer: A

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33. Paragraph : A scientist was asked to find the height of the roof of a dome shaped hall. He took a spherical ball of radius 20 cm which he suspend with the string from the roof of dome. The height of the ball above the ground was 5 cm when suspended. He noted the time of 20 oscillations to be 100 s.

The length of the string used to suspend the bob of pendulum is :

A. 6.39 m

B. 6.14 m

C. 6 m

D. 6.44 m.

Answer: B

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34. Paragraph : A scientist was asked to find the height of the roof of a dome shaped hall. He took a spherical ball of radius 20 cm which he suspend with the string from the roof of dome. The height of the ball above the ground was 5 cm when suspended. He noted the time of 20 oscillations to be 100 s.

The height of the roof of the dome from the ground is :

A. 6.19 m

B. 6.39 m

C. 6.59 m

D. 6.0 m.

Answer: C

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35. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3

cm/s when displacement is 4 cm.

The amplitude of SHM is :

A. 5 cm

B. 10 cm

C. 7 cm

D. 9 cm.

Answer: C

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36. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

The period of oscillation in seconds is :

A. π

B. 2π

C. 3π

D. 4π

Answer: B

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37. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

The maximum value of acceleration is :

A. $2 \quad \mathrm{cm}/\mathrm{s}^2$

B. $3 \quad \mathrm{cm}/\mathrm{s}^2$

C. $4 \quad \mathrm{cm}/\mathrm{s}^2$

D. $5 \quad cm/s^2$.

Answer: D

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38. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

If mass of body is 50 g the calculate the total energy of oscillation :

A. 6.25×10^{-5} J

B. 6.25×10^{-5} ergs

C. 5.5×10^{-5} J

D. 5.5×10^{-5} ergs

Answer: A

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39. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3

cm/s when displacement is 4 cm.

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

A. $T_1 < T_2$

B. $T_1 = T_2$

C. $T_1 > T_2$

D. $T_1 = 2T_2$.

Answer: A

40. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

For a particle executing SHM the displacement x is given by x = A sin ωt. Identify the graph which represents the variation of potential energy (P.E.) as a function of time and displacement x.

A. I, III

B. II, III

C. I, IV

D. II, IV.

Answer: B

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41. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3

cm/s when displacement is 4 cm.

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

A. 0.11

B. 0.21

C. 0.42

D. 0.1

Answer: D

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42. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

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

A. -4

B. 4

C. $4\sqrt{2}$

D. 8

Answer: C

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43. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

Two simple harmonic motions are represented by the equations $y_1 = 0.1 \sin(100\pi t + \pi/3)$ and y = 0.1 $\cos \pi t$. The phase difference of the velocity of particle 1 with respect to the velocity of particle 2 is :

A. $-\pi/6$

B. $\pi/3$

C. $-\pi/3$

D. $\pi/6$

Answer: A

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44. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

Starting from origin a body oscillates simple harmonically with a period of 2 s. After what time will its kineti energy be 75% of the total energy.

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

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

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

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

Answer: A

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45. A particle of mass 'm' executes simple harmonic motion with amplitude 'a' and frequency v. The average kinetic energy during its motion from the position of equilibrium to the end is :

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

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

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

D. πma^2v^2.

Answer: D

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46. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

The displacement of an object attached to a spring and executing simple harmonic motion is given by $x = 2 \times 10^{-2} \cos \pi t$ metres. The time at which the maximum speed first occurs is :

A. 0.75 s

B. 0.125 s

C. 0.25 s

D. 0.5 s

Answer: D

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47. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

A point mass oscillates along the x-axis according to the law $x = x_0 \cos \omega t - \frac{\pi}{4}$. If acceleration of the particle is written as $a = A \cos(\omega t + \delta)$, then

A. $A = x_0 oemga^2, \delta = \frac{\pi}{4}$

B. $A = x_0 \omega^2, \delta = -\frac{\pi}{4}$

C. $A = x_0 \omega^2, \delta = \frac{3\pi}{4}$

D. $A = x_0, \delta = -\frac{\pi}{4}$.

Answer: C

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48. Paragraph : A particle vibrates in S.H.M. along a straight line. Its velocity is 4 cm/s when its displacement is 3 cm and velocity is 3 cm/s when displacement is 4 cm.

A body of mass M is suspended by a string of length L. The horizontal velocity v at position A is just sufficient to make it reach the point B. The angle θ at which the speed of the bob is half of that at A, satisfies :

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

B. $\frac{\pi}{4} < \theta < \frac{\pi}{2}$

C. $\frac{\pi}{2} < \theta < \frac{3\pi}{4}$

D. $\frac{3\pi}{4} < \theta < \pi$.

Answer: D

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49. When a particle of mass m moves on the x-axis in a potential of the form $V(x) = kx^2$, it performs simple harmonic motion. The corresponding time period is proportional to

$\sqrt{\frac{m}{k}}$. As can be seen easily using dimensional analysis.

However, the motion of a particle can be periodic even when its potential energy increases on both sides of x = 0 in a way different from kx^2 and its total energy is such that the particle does not escape to infinity. Consider a particle of mass m moving on the x-axis. Its potential energy is $V(x) = \alpha x^4 (\alpha > 0)$ for |x| near the origin and becomes a constant equal to V_0 for $|x| \geq X_0$ (See Fig).

If the total energy of the particle is E, it will perform periodic motion only if :

A. $E < 0$

B. $E > 0$

C. $V_0 > E > 0$

D. $E > V_0$

Answer: C

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50. When a particle of mass m moves on the x-axis in a potential of the form $V(x) = kx^2$, it performs simple harmonic motion. The corresponding time period is proportional to $\sqrt{\frac{m}{k}}$. As can be seen easily using dimensional analysis.

However, the motion of a particle can be periodic even when its potential energy increases on both sides of x = 0 in a way different from kx^2 and its total energy is such that the particle does not escape to infinity.

Consider a particle of mass m moving on the x-axis. Its potential energy is $V(x) = \alpha x^4 (\alpha > 0)$ for |x| near the origin and becomes a constant equal to V_0 for $|x| \geq X_0$ (See Fig).

For periodic motion of small amplitude A, the time period T of this particle is proportional to :

A. $A\sqrt{\frac{m}{\alpha}}$

B. $\frac{1}{A}\sqrt{\frac{m}{\alpha}}$

C. $A\sqrt{\frac{\alpha}{m}}$

D. $\frac{1}{A}\sqrt{\frac{\alpha}{m}}$.

Answer: B

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51. When a particle of mass m moves on the x-axis in a potential of the form $V(x) = kx^2$, it performs simple harmonic motion. The corresponding time period is proportional to $\sqrt{\frac{m}{k}}$. As can be seen easily using dimensional analysis.

However, the motion of a particle can be periodic even when its potential energy increases on both sides of x = 0 in a way different from kx^2 and its total energy is such that the particle does not escape to infinity. Consider a particle of mass m moving on the x-axis. Its potential energy is $V(x) = \alpha x^4 (\alpha > 0)$ for |x| near the origin and becomes a constant equal to V_0 for $|x| \geq X_0$ (See Fig).

The acceleration of this particle of $|x| > X_0$ is

:

A. proportional to V_0

B. proportional to $\frac{V_0}{mX_0}$

C. proportional to $\sqrt{\frac{V_0}{mX_0}}$

D. zero.

Answer: D

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52. Which of the following energy-time graphs represents damped harmonic oscillator.

A.

B.

C.

D.

Answer: C

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53. The x-t graph of a particle undergoing simple harmonic motion is as shown in the figure.

The acceleration of the particle at $t = \frac{4}{3} s$ is :

A. $-\frac{\pi}{32} \mathrm{cm\ s}^{-2}$

B. $\frac{\sqrt{3}}{32} \pi^2 \mathrm{cm\ s}^{-2}$

C. $\frac{\pi^2}{32} \mathrm{cm\ s}^{-2}$

D. $-\frac{\sqrt{3}}{32} \pi^2 \mathrm{cm\ s}^{-2}$.

Answer: D

54. A child is sitting on a swing.Its minimum and maximum heights from the ground are 0.75 m and 2m respectively. Its maximum speed will be :

A. 10 m/s

B. 8 m/s

C. 5 m/s

D. 15 m/s

Answer: C

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55. Two springs A and B having spring constant k_A and $k_B(k_A = 2k_B)$ are stretched by applying force of equal magnitude. If energy stored in spring A is E_A then energy stored in B will be :

A. $2E_A$

B. $E_A/2$

C. $E_A/4$

D. $4E_A$.

Answer: A

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56. A simple pendulum of length l has a maximum angular displacement θ. The maximum kinetic energy of the bob of masss m will be :

A. $mg(1-\cos\theta)$

B. 2mgl

C. $mgl\cos\theta$

D. mgl.

Answer: A

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

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

B. 2kl

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

D. mgl.

Answer: D

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58. The angular velocities of three bodies in simple harmonic motion are $\omega_1, . \omega_2, \omega_3$ with their respective amplitudes as A_1, A_2, A_3. If all the three bodies have the same mass and 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. $A_1^2\omega_1^2 = A_2^2\omega_2^2 = A_3^2\omega_3^2$.

Answer: A

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59. The P.E. of a simple harmonic oscillator, when the particle is half way to its end point is :

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

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

C. $\frac{E}{8}$

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

Answer: B

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

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

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

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

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

Answer: B

61. Two simple harmonic motions of angular frequency 100 and 1000 rad s^{-1} have the same displacement amplitude. The ratio of their maximum acceleratins is :

A. $1 : 10^2$

B. $1 : 10^3$

C. $1 : 10^4$

D. $1 : 10$

Answer: A

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

(A) $y = \sin \omega t - \cos \omega t$

(B) $y = \sin^3 \omega t$

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

(D) $y=1+\omega t+\omega^2t^2$.

A. Only (A)

B. Only (D) does not represent SHM

C. Only (A) and (C)

D. Only (A) and (B).

Answer: C

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1. Two particles are executing simple harmonic motion of the same amplitude A and frequency ω along the x-axis. Their mean position is separated by distance $X_0 (X_0 > A)$. If the maximum separation between them is $(X_0 + A)$, the phase difference between their motion is

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

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

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

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

Answer: A

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2. A mass M, attached to a horizontal spring, executes S.H.M. with aplitude A_1. When the mass M passes through its mean position then a smaller mass m is placed over it and both of them move together with amplitude A_2. The ratio of $\left(\frac{A_1}{A_1}\right)$ is :

A. $\frac{M+m}{M}$

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

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

D. $\frac{M}{M+m}$

Answer: C

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3. A wooden cube (density of wood 'd') of side 'l' floats in a liquid of density $'\rho'$ with its upper and lower surfaces horizontal. If the cube is pushed slightly down and released, it performs simple harmonic motion of period 'T'. Then, 'T' is equal to :

A. $2\pi\sqrt{\dfrac{ld}{\rho g}}$

B. $2\pi\sqrt{\dfrac{l\rho}{dg}}$

C. $2\pi\sqrt{\dfrac{ld}{(\rho-d)g}}$

D. $2\pi\sqrt{\dfrac{ld}{(\rho-d)g}}$

Answer: A

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4. The phase space diagram for simple harmonic motion is a circle centered at the origin. In the figure, the two circles represent the same oscillator but for different initial conditions, and E_1 and E_2 are the total mechanical energies respectively. Then

A. $E_1 = \sqrt{2}E_2$

B. $E_1 = 2E_2$

C. $E_1 = 4E_2$

D. $E_1 = 16E_2$

Answer: C

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5. A particle of mass m is at rest at the origin at time t = 0.It is subjected to a force $F(t) = F_0 e^{-bt}$ in the x direction. Its speed v(t) is depicted by which of the following curves ?

A.

B.

C.

D.

Answer: D

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6. If a simple pendulum has significant amplitude (up to a factor of 1/e of original) only in the period between t = 0 to $t = \tau s$, then τ may be called the average life of the pendulum. When the spherical bob of the pendulum suffers a retardation (due to viscous drag) proportional to its velocity, with 'b' as the constant of proportionality, the average life time of the pendulum is (assuming dampling is small) in secods :

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

B. $\frac{0.693}{b}$

C. b

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

Answer: A

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7. The amplitude of a damped oscillator decreases to 0.9 times its original magnitude is 5 s. In another 10 s it will decrease to α times its original magnitude, where α equals :

A. 0.81

B. 0.729

C. 0.6

D. 0.7

Answer: B

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8. An ideal gas enclosed in a vertical cylindrical container supports a freely moving piston of mass M. The piston and cylinder have equal cross sectional area A. When the piston is in equilibrium, the volume of the gas is V_0 and its pressure is P_0. The piston is slightly displaced from the quilibrium position and released. Assuming that the system is completely isolated from its surrounding, the piston executes a simple harmonic motion with frequency :

A. $\frac{1}{2\pi}\frac{V_0 M P_0}{A^2\gamma}$

B. $\frac{1}{2\pi}\sqrt{\frac{A^2\gamma P_0}{M V_0}}$

C. $\frac{1}{2\pi}\sqrt{\frac{M V_0}{A\gamma P_0}}$

D. $\frac{1}{2\pi}\frac{A\gamma P_0}{V_0 M}$

Answer: B

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9. A particle moves with simple harmonic motion in a straight line. In first τ s, after starting from rest it travels a distance a, and in next τ s it travels 2a, in same direction, then :

A. time period of oscillations is 6τ

B. amplitude of motion is 3a

C. time period of oscillations is 8τ

D. amplitude of motion is 4a.

Answer: A

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10. For a simple pendulum, a graph is plotted between its kinetic energy (K.E.) and potential energy (P.E.) against its displacement d. Which one of the following represents these correctly ? (graph are schematic and not drawn to scale)

A.

B.

C.

D.

Answer: A

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Rcq

1. Two simple harmonic motions are represented by $y_1 = 5\left[\sin 2\pi t + \sqrt{3}\cos 2\pi t\right]$ and $y_2 = 5\sin\left(2\pi t + \frac{\pi}{4}\right)$ The ratio of their amplitudes is

A. $1:3$

B. $\sqrt{3}:1$

C. $1:1$

D. $2:1$

Answer: D

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2. A particle executing a simple harmonic motion has a period of 6 sec.The time taken by the particle to move from the mean position to half the amplitude is

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

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

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

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

Answer: B

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3. A particle executes SHM with amplitude 0.2 m and time period 24 s . The time required for it to move from the mean position to a point 0.1 m from the mean position is

A. 2 s

B. 3 s

C. 8 s

D. 12 s

Answer: A

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4. The circular motion of a particle with constant speed is

A. Periodic but not SHM

B. SHM but not Periodic

C. Periodic and also SHM

D. Neither periodic nor SHM.

Answer: A

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5. The ratio of kinetic energy to the potential energy of a particle executing SHM at a distance equal to half its amplitude, the distance being measured from its equilibrium position is

A. $4:1$

B. $8:1$

C. $3:1$

D. $2:1$

Answer: C

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6. A mass M is suspended from a light spring. An additional mass m added displaces the spring further by a distance x. Now the combined mass will oscillate on the spring with a period :

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

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

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

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

Answer: B

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7. A 10 kg collar is attached to a spring (spring constant 600 N/m.), it slides without friction over a horizontal rod. The collar is displaced from the equilibrium position by 20 cm and released. What is the speed of the oscillation ?

A. $\sqrt{60} \times 0.2 \quad \mathrm{m/s}$

B. $60 \times 0.2 \quad \mathrm{m/s}$

C. $60 \times 2 \quad \mathrm{m/s}$

D. $6 \times 0.2 \quad \mathrm{m/s}$.

Answer: A

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