DPP

DAILY PRACTICE PROBLEMS

CLASS : XIth | **SUBJECT : PHYSICS**

DATE : | **DPP NO. : 3**

Topic :- OSCILLATIONS

1. Due to some force F_1 a body oscillates with period $4/5\ s$ and due to other force F_2 oscillates with period $3/5\ s$. If both forces act simultaneously, the new period will be

   a) 0.72 s b) 0.64 s c) 0.48 s d) 0.36 s

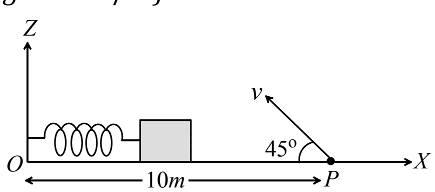
2. The time period of a mass suspended from a spring is 5 s. The spring is cut into four equal parts and the same mass is now suspended from one of its parts. The period is now

   a) 5 s b) 2.5 s c) 1.25 s d) $\frac{1}{16}\ s$

3. A block of mass M is suspended from a light spring of force constant k. another mass m moving upwards with velocity v hits the mass M and gets embedded in it. What will be the amplitude of the combined mass?

   a) $\frac{mv}{\sqrt{(M - m)k}}$ b) $\frac{Mv}{(M - m)k}$ c) $\frac{mv}{\sqrt{(M + m)k}}$ d) $\frac{Mv}{\sqrt{(M + m)k}}$

4. A small block is connected to one end of a massless spring of un-stretched length $4.9m$. The other end of the spring (see the figure) is fixed. The system lies on a horizontal frictionless surface. The block is stretched by $0.2m$ and released from rest at $t = 0$. It then executes simple harmonic motion with angular frequency $\omega = \frac{\pi}{3} rad/s$. Simultaneously at $t = 0$, a small pebble is projected with speed v from point P is at angle of 45° as shown in the figure. Point P is at a horizontal distance of 10 m from O. If the pebble hits the block at $t = 1s$, the value of v is (take $g = 10m/s^2$)



   a) $\sqrt{50}m/s$ b) $\sqrt{51}m/s$ c) $\sqrt{52}m/s$ d) $\sqrt{53}m/s$

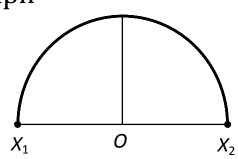
5. The equation of motion of a particle is $\frac{d^2y}{dt^2} + Ky = 0$, where K is positive constant. The time period of the motion is given by

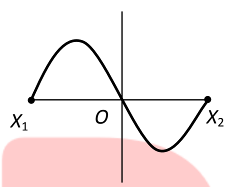
a) $\frac{2\pi}{K}$ b) $2\pi K$ c) $\frac{2\pi}{\sqrt{K}}$ d) $2\pi\sqrt{K}$

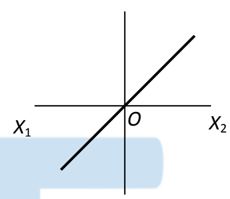
6. A particle executing a simple harmonic motion has a period of 6 s. The time taken by the particle to move from the mean position to half the amplitude, starting from the mean position is

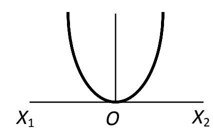
a) $\frac{1}{4}$ s b) $\frac{3}{4}$ s c) $\frac{1}{2}$ s d) $\frac{3}{2}$ s

7. 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) 

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

a) The particle so moving executes SHM

b) The projection of the particle of any one of the diameters executes SHM

c) The projection of the particle of any one of the diameters executes SHM

d) None of the above

9. A particle oscillating under a force $\vec{F} = -k\vec{x} - b\vec{v}$ is a (k and b are constant)

a) Simple harmonic oscillator

b) No linear oscillator

c) Damped oscillator

d) Forced oscillator

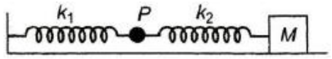
10. Infinite springs with force constants k,$2k$,$4k$ and $8k$..... respectively are connected in series. The effective force constant of the spring will be

a) $2k$ b) k c) $k/2$ d) 2048

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

a) $2\pi\sqrt{\frac{1}{g\cos\alpha}}$ b) $2\pi\sqrt{\frac{1}{g\sin\alpha}}$ c) $2\pi\sqrt{\frac{l}{g}}$ d) $2\pi\sqrt{\frac{1}{g\tan\alpha}}$

12. The mass M shown in the figure oscillates in simple harmonic motion with amplitude A. The amplitude of the point P is



a) $\frac{k_1 A}{k_2}$ b) $\frac{k_2 A}{k_1}$ c) $\frac{k_1 A}{k_1 + k_2}$ d) $\frac{k_2 A}{k_1 + k_2}$

13. The time period of a simple pendulum of length L as measured in an elevator descending with acceleration $\frac{g}{3}$ is

a) $2\pi\sqrt{\frac{3L}{g}}$ b) $\pi\sqrt{\left(\frac{3L}{g}\right)}$ c) $2\pi\sqrt{\left(\frac{3L}{2g}\right)}$ d) $2\pi\sqrt{\left(\frac{2L}{3g}\right)}$

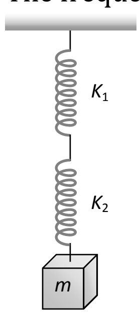
14. A simple pendulum is suspended from the ceiling of a lift. When the lift is at rest its time period is T. With what acceleration should the lift be accelerated upwards in order to reduce its period to $T/2$? (g is acceleration due to gravity)

a) 2 g b) 3 g c) 4 g d) g

15. 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

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

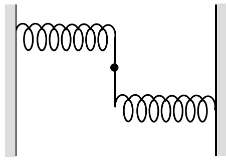


a) $\frac{1}{2\pi}\sqrt{\frac{K}{m}}$ b) $\frac{1}{2\pi}\sqrt{\frac{(K_1 + K_2)m}{K_1 K_2}}$ c) $2\pi\sqrt{\frac{K}{m}}$ d) $\frac{1}{2\pi}\sqrt{\frac{K_1 K_2}{m(K_1 + K_2)}}$

17. When a body of mass 1.0 kg is suspended from a certain light spring hanging vertically, its length increases by 5 cm. by suspending 2.0 kg block to the spring and if the block is pulled through 10 cm and released, the maximum velocity in it (in ms^{-1}) is (acceleration due to gravity=10 ms^{-2})

a) 0.5 b) 1 c) 2 d) 4

18. A uniform rod of length L and mass M is pivoted at the centre. Its two ends are attached to two springs of equal spring constant k. The springs are fixed to rigid supports as shown in the figure, and the rod is free to oscillate in the horizontal plane. The rod is gently pushed through a small angle θ in one direction and released. The frequency of oscillation is



a) $\frac{1}{2\pi}\sqrt{\frac{2k}{M}}$ b) $\frac{1}{2\pi}\sqrt{\frac{k}{M}}$ c) $\frac{1}{2\pi}\sqrt{\frac{6k}{M}}$ d) $\frac{1}{2\pi}\sqrt{\frac{24k}{M}}$

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

a) Simple harmonic b) Circular c) Elliptical d) Parabolic

20. A block of mass m, attached to a spring of spring constant k, oscillates on a smooth horizontal table. The other end of the spring is fixed to a wall. The block has a speed v when the spring is at its natural length. Before coming to an instantaneous rest, if the block moves a distance x from the mean position, then

a) $x = \sqrt{m/k}$ b) $x = \frac{1}{v}\sqrt{m/k}$ c) $x = v\sqrt{m/k}$ d) $x = \sqrt{mv/k}$