DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 5**

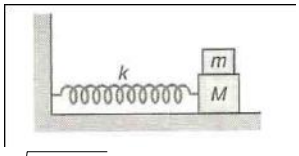
Topic :- OSCILLATIONS

1. The bob of a simple pendulum is of mass 10 g. It is suspended with a thread of 1 m. If we hold the bob so as to stretch the string horizontally and release it, what will be the tension at the lowest position? (g= 10 ms^{-2})
   a) zero b) 0.1 N c) 0.3 N d) 1.0 N

2. A body of mass 20 g connected to spring of constant k executes simple harmonic motion with a frequency of $\left(\frac{5}{\pi}\right)$ Hz. The value of spring constant is
   a) 4 Nm^{-1} b) 3 Nm^{-1} c) 2 Nm^{-1} d) 5 Nm^{-1}

3 Two SHMs are respectively represented by $y_1 = a\sin(\omega t - kx)$ and $y_2 = b\cos(\omega t - kx)$ The phase difference between the two is
   a) $\pi/6$ b) $\pi/4$ c) $\pi/2$ d) π

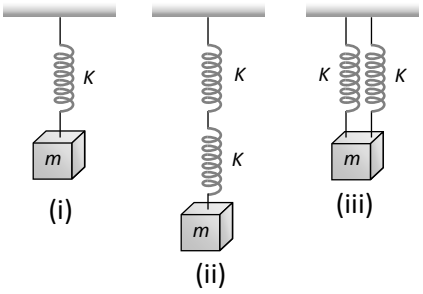
4. A mass M is attached to a horizontal spring of force constant k fixed on one side to a rigid support as shown in figure. The mass oscillates on a frictionless surface with time period T and amplitude A . When the mass is in equilibrium position. Another mass m is gently placed on it. What will be the new amplitude of oscillations?



   a) $A\sqrt{\left(\frac{M}{M-m}\right)}$ b) $A\sqrt{\left(\frac{M-m}{M}\right)}$ c) $A\sqrt{\left(\frac{M}{M+m}\right)}$ d) $A\sqrt{\left(\frac{M+m}{M}\right)}$

5. 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 become $5T/3$. Then the ratio of $\frac{m}{M}$ is
   a) 3/5 b) 25/9 c) 16/9 d) 5/3

6. 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) $2:\frac{1}{\sqrt{2}}:1$

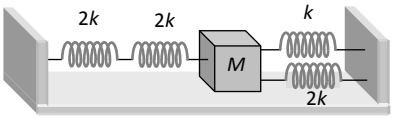
7. Two simple harmonic motions are represented by $y_1 = 4\sin(4\pi t + \frac{\pi}{2})$ and $y_2 = 3\cos(4\pi t)$. The resultant amplitude is

a) 7 b) 1 c) 5 d) $2+\sqrt{3}$

8. Two simple pendulums 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. Then which is correct

a) Amplitude of B greater than A b) Amplitude of B smaller than A
c) Amplitude will be same d) None of these

9. Four massless springs whose force constants are $2k$,$2k$,k and $2k$ respectively are attached to a mass M kept on a frictionless plane (as shown in figure). If the mass M is displaced in the horizontal direction, then the frequency of oscillation of the system is



a) $\frac{1}{2\pi}\sqrt{\frac{k}{4M}}$ b) $\frac{1}{2\pi}\sqrt{\frac{4k}{M}}$ c) $\frac{1}{2\pi}\sqrt{\frac{k}{7M}}$ d) $\frac{1}{2\pi}\sqrt{\frac{7k}{M}}$

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

a) $-AKx$ b) $A\cos(Kx)$ c) $A\exp(-Kx)$ d) AKx

11. The period of a simple pendulum inside a stationary lift is T. The lift accelerates upwards with an acceleration of $g/3$. The time period of pendulum will be

a) $\sqrt{2}\,T$ b) $\frac{T}{\sqrt{2}}$ c) $\frac{\sqrt{3}}{2}T$ d) $\frac{T}{3}$

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

a) 0.4 s b) 0.3 s c) 0.2 s d) 0.6 s

13. A body having natural frequency v' is executing forced oscillations under a driving force of frequency. The system will vibrate

a) with frequency of driving force v b) with its natural frequency v'

c) with mean frequency of the two $[(v + v')/2$ d) None of the above

14. 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

15. A wooden cube (density of wood d) of slide l floats in a liquid of density ρ with its upper and lower surfaces horizontal. If the cube is pushed slightly down and released, its performs simple harmonics motion of period T, then T is equal

a) $2\pi\sqrt{\frac{l\rho}{(\rho - d)g}}$ b) $2\pi\sqrt{\frac{ld}{\rho g}}$ c) $2\pi\sqrt{\frac{l\rho}{dg}}$ d) $2\pi\sqrt{\frac{ld}{(\rho - d)g}}$

16. The restoring force of SHM is maximum when particle

a) Displacement is maximum b) Is half way between the mean and extreme position

c) Crosses mean position d) Is at rest

17. A particle is oscillating in SHM. What fraction of total energy is kinetic when the particle is at $A/2$ from the mean position? (A is the amplitude of oscillation)

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

18. The displacement equation of a simple harmonic oscillator is given by

$y = A\sin\omega t - B\cos\omega t$

The amplitude of the oscillator will be

a) $A - B$ b) $A + B$ c) $\sqrt{A^2 + B^2}$ d) $A^2 + B^2$

19. What is the effect on the time period of a simple pendulum if the mass of the bob is doubled

a) Halved b) Doubled c) Becomes eight times d) No effect

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

a) $1/2$ b) $1/\sqrt{2}$ c) $1/(\sqrt{2} - 1)$ d) $1/\sqrt{3}$