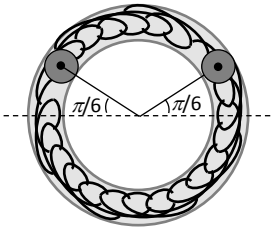
DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 2**

Topic :- OSCILLATIONS

1. 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 rigid smooth pipe bent in the form of circle as shown in the figure. The pipe is fixed in a horizontal plane. The centres of the balls can move in a circle of radius $0.06\ m$. Each spring has a natural length of $0.06\pi\ m$ and force constant $0.1N/m$. Initially both the balls are displaced by an angle $\theta = \pi/6$ radian with respect to the diameter PQ of the circle and released from rest. The frequency of oscillation of the ball B is



a) $\pi\ Hz$ b) $\frac{1}{\pi} Hz$ c) $2\pi\ Hz$ d) $\frac{1}{2\pi} Hz$

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

a) $\frac{\pi}{2}$ cms^{-2} b) $\frac{\pi^2}{2}$ cms^{-2} c) $\frac{\pi}{4}$ cms^{-2} d) $\frac{\pi}{4}$ cms^{-2}

3. A particle moves according to the law, $= r\cos\frac{\pi t}{2.}$. The distance covered by it the time interval between t= 0 to t=3s is

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

4. How does the time period of pendulum vary with length

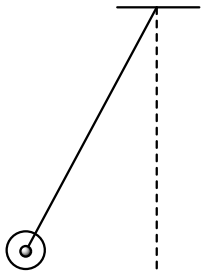
a) $\sqrt{L}$ b) $\sqrt{\frac{L}{2}}$ c) $\frac{1}{\sqrt{L}}$ d) $2L$

5. A force of $6.4\ N$ stretches a vertical spring by $0.1\ m$. The mass that must be suspended from the

spring so that it oscillates with a period of $\left(\frac{\pi}{4}\right)s$. is

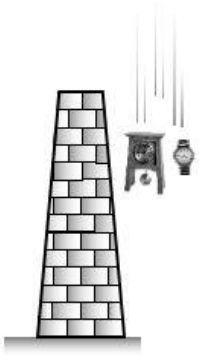
a) $\left(\frac{\pi}{4}\right)kg$ b) $1kg$ c) $\left(\frac{1}{\pi}\right)kg$ d) $10kg$

6. A metal rod of length L and mass m is pivoted at one end. A thin disk of mass M and radius $R(<L)$ is attached at its centre to the free end of the rod. Consider two ways the disc is attached **case *A***- the disc is not free to rotate about its centre and **case *B*** – the disc is free to rotate about its centre. The rod-disc system performs SHM in vertical plane after being released from the same displaced position. Which of the following statement(s) is/are true?



a) Restoring torque in case A=Restoring torque in case B
b) Restoring torque in case A<Restoring torque in case B
c) Angular frequency for case A<Angular frequency for case B
d) Angular frequency for case A<Angular frequency for case B

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



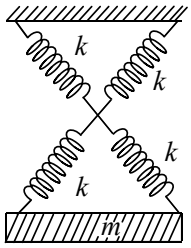
a) Both will keep correct time during the fall
b) Both will kept incorrect time during the fall
c) Wrist watch will keep correct time and clock will become fast
d) Clock will stop but wrist watch will function normally

8. For a particle executing SHM, the kinetic energy k is given by $k = k_0\cos^2 \omega t$. The equation of its

displacement can be

a) $\left(\frac{k_0}{m\omega^2}\right)^{1/2} \sin\ \omega t$ b) $\left(\frac{2k_0}{m\omega^2}\right)^{1/2} \sin\ \omega t$ c) $\left(\frac{2\omega^2}{m\,k_0}\right)^{1/2} \sin\ \omega t$ d) $\left(\frac{2k_0}{m\omega}\right)^{1/2} \sin\ \omega t$

9. As shown in figure, a simple harmonic motion oscillator having identical four springs has time period

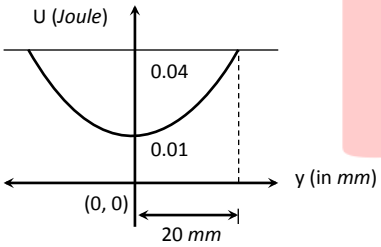


a) $T = 2\pi\sqrt{\frac{m}{4k}}$ b) $T = 2\pi\sqrt{\frac{m}{2k}}$ c) $T = 2\pi\sqrt{\frac{m}{k}}$ d) $T = 2\pi\sqrt{\frac{2m}{k}}$

10. A particle of mass 200 g executes SHM. The restoring force is provided by a spring of force constant 80 N/m. The time period of oscillation is

a) 0.31 s b) 0.15 s c) 0.05 s d) 0.02 s

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



a) $1 \times 10^2 N/m$ b) $150\ N/m$ c) $0.667 \times 10^2 N/m$ d) $3 \times 10^2 N/m$

12. 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 origin value
b) First decrease and then increase to the origin value
c) Remain unchanged
d) Increase towards a saturation value

13. Length of a simple pendulum is l and its maximum angular displacement is θ, then its maximum K.E. is

a) $mgl \sin\theta$ b) $mgl(1 + \sin\theta)$ c) $mgl(1 + \cos\theta)$ d) $mgl(1 - \cos\theta)$

14. A simple pendulum has time period T. The bob is given negative charge and surface below it is

given positive charge. The new time period will be

a) Less than T b) Greater than T c) Equal to T d) Infinite

15. The displacement of a particle executing SHM is given by y=0.25 sin 200t cm. the maximum speed of the particle is

a) 200 cms^{-1} b) 100 cms^{-1} c) 50 cms^{-1} d) 5.25 cms^{-1}

16. 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

17. Displacement-time equation of a particle executing SHM is, $x = 4\sin\omega t + 3\sin(\omega t + \pi/3)$. Here x is in centimeter and t in second. The amplitude of oscillation of the particle is approximately

a) 5 cm b) 6 cm c) 7 cm d) 9 cm

18. A plate oscillates with time period $'T'$. Suddenly, another plate put on the first time, then time period

a) Will decrease b) Will increase c) Will be same d) None of these

19. 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 period

a) $T = 2\pi\sqrt{\frac{mg}{X(M+m)}}$ b) $T = 2\pi\sqrt{\frac{(M+m)X}{mg}}$

c) $T = \pi/2\sqrt{\frac{mg}{X(M+m)}}$ d) $T = 2\pi\sqrt{\frac{(M+m)}{mg}}$

20. 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) $Mg/2K$