CBSE

OSCILLATIONS WS 6

Class 11 - Physics

Section A

1. Two SHM's with same amplitude and time period, when acting together in perpendicular directions with a phase difference of $\frac{\pi}{2}$, give rise to: **[1]**

   a) elliptical motion

   b) straight motion

   c) non-circular motion

   d) circular motion

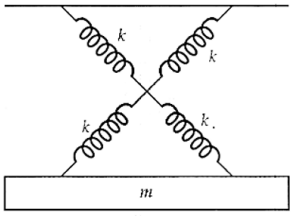
2. **State True or False:** **[1]**

   (a) The projection of uniform circular motion upon a diameter of the circle executes simple harmonic motion. **[1]**

3. **Fill in the blanks:** **[1]**

   (a) A simple harmonic motion may be defined as the _____ of uniform circular motion upon a diameter of a circle. **[1]**

4. As shown in the figure below, a simple harmonic motion oscillator having identical four springs has time period **[1]**



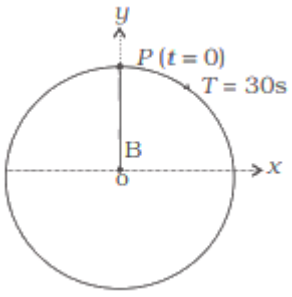
   a) T = $2\pi\sqrt{\frac{m}{4k}}$

   b) T = $2\pi\sqrt{\frac{m}{8k}}$

   c) T = $2\pi\sqrt{\frac{m}{k}}$

   d) T = $2\pi\sqrt{\frac{m}{2k}}$

5. Figure shows the circular motion of a particle. The radius of the circle, the period, sense of revolution and the initial position are indicated on the figure. The simple harmonic motion of the x-projection of the radius vector of the rotating particle P is **[1]**



   a) $x(t) = B\cos\left(\frac{\pi t}{15} + \frac{\pi}{2}\right)$

   b) $x(t) = B\cos\left(\frac{\pi t}{15}\right)$

   c) $x(t) = B\sin\left(\frac{2\pi t}{30}\right)$

   d) $x(t) = B\sin\left(\frac{\pi t}{15} + \frac{\pi}{2}\right)$

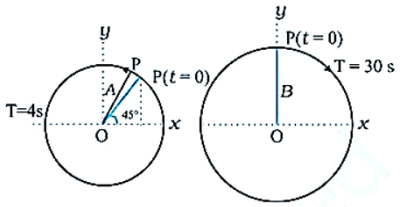
6. Is the motion of a simple pendulum strictly simple harmonic? **[1]**

Section B

7. A simple pendulum has a time period exactly 2 s when used in a laboratory at north pole. What will be the time **[3]**

period if the same pendulum is used in a laboratory at the equator? Account for the earth's rotation only. Take g = $\frac{GM}{R^2}$ 9.8 m/s^2 and radius of earth = 6400 km.

8. The figure given below depicts two circular motions. The radius of the circle, the period of revolution, the initial position and the sense of revolution are indicated in the figures. Obtain the simple harmonic motions of the x-projection of the radius vector of the rotating particle P in each case. **[3]**



Section C

9. Show that simple harmonic motion may be regarded as the projection of uniform circular motion along the diameter of the circle. Hence derive an expression for the displacement of a particle in S.H.M. **[5]**

10. Plot the corresponding reference circle for each of the following simple harmonic motions. Indicate the initial (t = 0) position of the particle, the radius of the circle, and the angular speed of the rotating particle. For simplicity, the sense of rotation may be fixed to be anticlockwise in every case: (x is in cm and t is in s). **[5]**

a. $x = -2 \sin (3t + \frac{\pi}{3})$

b. $x = \cos (\frac{\pi}{6} - t)$

c. $x = 3 \sin (2\pi t + \frac{\pi}{4})$

d. $x = 2 \cos \pi t$