Problem Set on SHM

1. A particle performs a linear S.H.M along a path 10 cm long. The particle starts from a distance of 1 cm from the mean position towards the positive extremity. Find the epoch and the phase of motion when the displacement is 2.5 cm.

2. The periodic time of a body executing S.H.M. is 2 s. After how much time interval from t =0 will its displacement be half the amplitude?

3. A particle executes S.H.M of amplitude 25 cm and time period 1/3 seconds. What is the minimum time required for a particle to move between two points located at a distance of 12.5 cm on either side of the mean position?

4. A particle performs S.H.M of period 4 s. If the amplitude of its oscillations is 4 cm, find the time it takes to describe 1 cm from the extreme position.

5. A particle performs S.H.M of period 12 s along a path 16 cm long. If it is initially at the positive extremity, how much time will it take to cover a distance of 6 cm from that position?

6. The shortest distance travelled by a particle performing S.H.M from its mean position in 2 seconds is equal to √3/2 of its amplitude. Find its period.

7. A particle performing S.H.M has a period of 6 s and amplitude of 8 cm. The particle starts from the mean position and moves towards the positive extremity. Find its displacement, velocity, and acceleration 0.5 s after the start.

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9. A particle of mass 10 g performs S.H. M of amplitude 10 cm and period 2π s. Determine its kinetic and potential energies when it is at a distance of 8 cm from its equilibrium position.

10. A particle of mass 10 g executes linear S.H.M. of amplitude 5 cm with a period of 2 s. Find its PE and KE, 1/6 s after it has crossed the mean position.

11. The total energy of a particle of mass 0.5 kg performing S.H.M is 25 J. What is its speed when crossing the centre of its path?

12. A particle performs a linear S.H.M of amplitude 10 cm. Find at what distance from the mean position its PE is equal to its KE.

13. Find the relation between amplitude and displacement at the instant when the K.E. of a particle performing S.H.M is three times its P.E.

14. When is the displacement in S.H.M one-third of the amplitude, what fraction of total energy is kinetic and what fraction is potential? At what displacement is the energy half kinetic and half potential?

15. An object of mass 0.2 kg executes S.H.M along the X-axis with a frequency of 25 Hz. At the position x = 0.04 m, the object has a K.E. of 0.5 J and P.E. of 0.4 J. Find the amplitude of its oscillations.

16. The amplitude of a particle in S.H.M is 2 cm and the total energy of its oscillation is 3×10^{-7} J. At what distance from the mean position will the particle be acted upon by a force of 2.25×10^{-5} N when vibrating?

17. A body of mass 100 g performs S.H.M along a path of length 20 cm and with a period of 4 s. Find the restoring force acting upon it at a displacement of 3 cm from the mean position? Find also the total energy of the body.

18. A particle of mass 200 g performs S.H.M of amplitude 0.1m and period 3.14 second. Find its K.E. and P.E. when it is at a distance of 0.03 m from the mean position.