

PROBLEMS FOR PRACTICE

- (1) A particle is executing S.H.M. of amplitude 5cm and period of 2s. Find the speed of the particle at a point where its acceleration is half of its maximum value.
(Ans : 13.6 cm/s)
- (2) A particle performs S.H.M. of period 12 second and amplitude 8cm. If initially the particle is at the positive extremity, how much time will it take to cover a distance of 6 cm from the extreme position ?
(Ans : 2.517s)
- (3) When the displacement in S.H.M. is $\frac{1}{3}$ rd of the amplitude. What fraction of total energy is kinetic energy and what fraction is potential energy ?
[Ans : $\frac{8}{9}$ ($\frac{1}{9}$)]
- (4) The displacement of a particle performing linear S.H.M. is given by $x = 6 \sin \left(3\pi t + \frac{5\pi}{6} \right)$ meter. Find amplitude, frequency and the phase constant of the motion.
(Ans : $a = 6\text{m}$, $f = 1.5 \text{ Hz}$, $\phi = \frac{5\pi}{6}$ rad)
- (5) The period of oscillation of simple pendulum increases by 20% when its length is increased by 44cm. Find its (i) initial length (ii) initial period of oscillation.
(Ans : $L_1 = 1\text{m}$, $T_1 = 2.007\text{s}$)
- (6) A clock regulated by a seconds pendulum keeps correct time. During summer the length of the pendulum increases to 1.01m. How much will the clock gain or lose in one day? ($g = 9.8 \text{ m/s}^2$)
(Ans : Lose time 734.4 s)
- (7) An object performing S.H.M. with mass of 0.5 kg, force constant 10N/m and amplitude 3cm
(a) What is the total energy of object? (b) What is its maximum speed? (c) What is the speed at $x = 2 \text{ cm}$? d) What are kinetic and potential energies when $x = 2 \text{ cm}$?
(Ans : $E = 0.0045\text{J}$, $V_{\text{max}} = 0.1342\text{m/s}$, $V = 0.1 \text{ m/s}$, $K.E. = 0.0025\text{J}$, $P.E. = 0.002\text{J}$)
- (8) A simple pendulum is used in physics laboratory for experiment to obtain experimental value of gravitational acceleration g . A student measures the length of pendulum 0.51m, displaces it through 10° from equilibrium position and released it. Using a stopwatch, the student measures period of pendulum as 1.44s. Determine the experimental value of the gravitational acceleration.
(Ans : $g = 9.712 \text{ m/s}^2$.)
- (9) A particle executes S.H.M. with amplitude of 10 cm and period of 10 s. Find the (i) velocity, (ii) acceleration of the particle at a distance 5 cm from the equilibrium position.
(Ans : $\pm 5.442 \text{ cm/s}$, -1.974 cm/s^2)
- (10) A body describes S.H.M. in a path 0.12 m long. Its velocity at the centre of the line is 0.12 m/s. Find the period, and magnitude of velocity at a distance $\sqrt{3} \times 10^{-2} \text{ m}$ from the central position.
(Ans : 3.142 s, 0.1149 m/s)
- (11) A particle executes S.H.M. with a period 8s. Find the time in which half the total energy is potential.
(Ans : 1 s)