

Chapter # 16 (Oscillations)

- 1- A simple pendulum has a period of 3.0 s on the earth. What would its period be on the moon where $g(\text{moon}) = 1.67 \text{ m/s}^2$? [7.3 s]
- 2- An oscillatory mass-spring system has a total mechanical energy of 1J, an amplitude of 10 cm and a maximum speed of 1 m/s. Neglecting friction, what is the mass ? [2 kg]
- 3- A 5-kg mass attached to a spring executes a simple harmonic motion with a period of 2.0 s. If the total energy of the system is 10 J, the amplitude of oscillation (in m) is: [0.637]
- 4- A 0.4-kg mass attached to a spring of force constant 40 N/m vibrates with a simple harmonic motion of amplitude 10 cm. Calculate the shortest time that is taken by the mass to move from $x = 0$ to $x = 10$ cm. [0.157 s]
- 5- A mass of 1.0 kg connected to a light spring of force constant 30 N/m oscillates on a horizontal frictionless surface with magnitude 3 cm. Find the kinetic energy of the system when the displacement equals 2 cm. [$7.5 \cdot 10^{-3}$ J]
- 6- A simple pendulum has a length of 3.00 m. Determine the change in its period if it is taken from a point where $g=9.80 \text{ m/s}^2$ to a higher elevation, where the acceleration due to gravity $g=9.75 \text{ m/s}^2$. [increases by 8.9 ms]
- 7- A 200 g mass is attached to a spring and executes simple harmonic motion with a period of 0.25 s. If the total energy of the system is 2 J, Find the amplitude of motion. [18 cm]
- 8- If the amplitude of a system moving with simple harmonic motion is doubled, the total energy will be: [4 times larger]
- 9- A particle at the end of a spring executes simple harmonic motion with an amplitude of 4.0 cm. At what displacement (x) will its speed be equal to one half its maximum speed? [3.46 cm]
- 10- A particle of mass $m=0.14$ kg at the end of a spring executes a simple harmonic motion according to the equation: $x=0.2 \cos(10t + \pi/2)$ Find the maximum potential energy of the spring.? [0.28 J]
- 11- At a certain instant, the displacement of a particle executing simple harmonic motion is 2.0 m, and its acceleration is -6.0 m/s^2 . Find its frequency of oscillation. [0.28 Hz]
- 12- A simple pendulum of length 1.30 m makes 50.0 complete oscillations in 100 seconds on a certain planet. Find the acceleration due to gravity on this planet. [12.8 m/s^2]
- 13- A 0.5-kg box, connected to a light spring of force constant 20 N/m, oscillates on a horizontal frictionless surface. The amplitude of the motion is 3.0 cm. Find the speed of the box when its displacement $x = 2.6$ cm. [0.09 m/s]
- 14- A 3-kg block, attached to a spring, executes simple harmonic motion on a horizontal frictionless surface according to $x = 2 \cos(50 t + 3.14)$ where x is in meters and t is in seconds. Find the value of the spring constant. [7500 N/m]