

**AP Physics 1**  
**Oscillation Practice Problems**

- 1.) A spring oscillates with a period of 0.50 s when a mass of 0.60 kg is hung on it. What will the period be if only 0.30 kg is hung on it?
- 2.) A 7.00 kg mass is hung from the bottom end of a vertical spring fastened to an overhead beam. The mass is set into vertical oscillations having a period of 2.60 s. Find the force constant of the spring.
- 3.) A 0.500 kg mass at the end of a spring vibrates 3.0 times per second with an amplitude of 0.15 m. Determine
  - a.) the velocity when it passes the equilibrium point
  - b.) the total energy of the system
  - c.) the equations describing the position  $x$ , velocity  $v$ , and acceleration  $a$  of the mass, assuming that at  $t = 0$ ,  $x$  was a maximum
- 4.) A 0.200 kg mass is attached to a spring and executes simple harmonic motion with a period of 0.250 s. If the total energy of the system is 2.00 J, find
  - a.) the force constant of the spring
  - b.) the amplitude of the motion
- 5.) Find the mass that oscillates with a period of 0.350 s when attached to a spring with a force constant of 10.0 N/m.
- 6.) A simple pendulum with a length of 2.00 m oscillates in a location where  $g = 9.80 \text{ m/s}^2$ . How many complete oscillations does it make in 5.00 minutes?
- 7.) A 0.250 kg mass oscillates on a spring and its  $x$ -position is described by the equation:  $x = (0.240 \text{ m})\cos\left(12.0 \frac{\text{rad}}{\text{s}}t\right)$ . Find
  - a.) the period of oscillation
  - b.) the force constant of the spring
  - c.) the total energy of the mass-spring system
  - d.) the speed of the mass at the equilibrium position
- 8.) A 0.500 kg mass attached to a spring with force constant  $k = 20.0 \text{ N/m}$  oscillates in simple harmonic motion. If the total energy of the mass-spring system is 2.00 J find
  - a.) the maximum velocity
  - b.) the amplitude of the motion
- 9.) The acceleration due to gravity on Mars is  $3.7 \text{ m/s}^2$ .
  - a.) What length pendulum has a period of one second period on Earth? What length pendulum has a one second period on Mars?
  - b.) A mass is suspended from a spring with a force constant of 10 N/m. Find the mass suspended from this spring that would result in a one second period on Earth and on Mars.
- 10.) What is the period that a simple pendulum with a length of 2.50 m on the surface of the Earth
- 11.) A 1.50 m simple pendulum has a period of 5.00 s on the surface of Planet X. What is the acceleration due to gravity on the surface of Planet X?