

Name\_\_\_\_\_

**Phys 2010 (NSCC), Spring 2007**  
**Problem Set #11**

**1.** A spring stretches by 3.9 cm when a 10-g object is hung from it. The object is replaced with a block of mass 25 g that oscillates in simple harmonic motion.

(a) What is the force constant of the spring? (b) Calculate the period of motion for the oscillating mass.

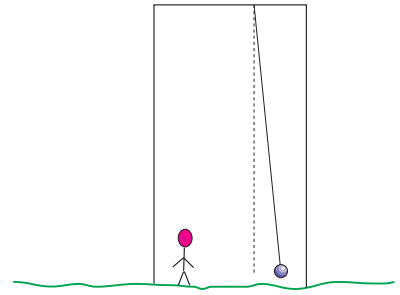
**2.** A vertical mass–spring system oscillates with an amplitude of 4.5 cm. If the spring constant is 250 N/m and the hanging mass is 0.40 kg, determine: (a) The frequency of the oscillations of the mass. (b) The maximum speed of the mass. (c) The maximum acceleration of the mass.

**3.** A 0.400 kg mass oscillates on the end of a spring with force constant 200 N/m. Its maximum speed (as it passes through the no-force position) is  $1.30 \frac{\text{m}}{\text{s}}$ .

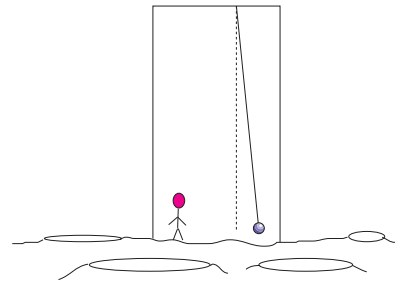
(a) What is the total mechanical energy of the system? (b) What is the amplitude of the motion?

**4.** For the oscillating mass in problem 3, by how much is the spring extended (or compressed) when the speed of the mass is  $1.00 \frac{\text{m}}{\text{s}}$ ?

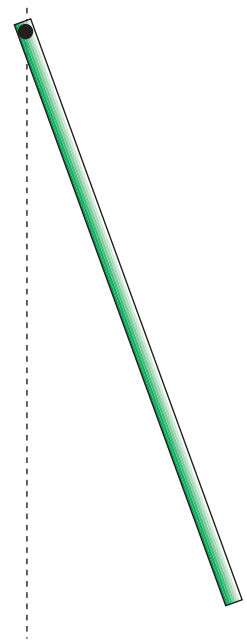
5. A man enters a tall tower, needing to know its height. He notes that a long simple pendulum extends from the ceiling almost to the floor and that its period is 15.5 s. How tall is the tower?



6. Suppose the pendulum in Problem 5 is taken to the moon where the acceleration of gravity is  $1.67 \frac{\text{m}}{\text{s}^2}$ . What is the period of the pendulum there?



7. A pendulum (*not* a simple one) is made from a uniform rod pivoted at one end, making small oscillations with the vertical. The rod has length 2.0 m. What is the period of oscillation for this pendulum? (I have not given the mass of the rod, but you don't need it.)



8. A harmonic wave travels along a rope; the distance between successive maxima is 0.52 m and any point on the rope makes 8.0 oscillations every second. What is the speed of waves on the rope?