Name _____

Homework Questions
SHM #2

Multiple Choice Practice

**For questions 1 and 2:*
A simple pendulum has a period of 2 s for small amplitude oscillations.

1. The length of the pendulum is most nearly

   (A) 1/6 m (B) 1/4 m (C) 1/2 m (D) 1 m (E) 2 m

2. Which of the following equations could represent the angle θ that the pendulum makes with the vertical as a function of time t ?

   (A) $\theta = \theta_{max} \sin \frac{\pi}{2} t$ (B) $\theta = \theta_{max} \sin \pi t$ (C) $\theta = \theta_{max}, \sin 2\pi t$ (D) $\theta = \theta_{max} \sin 4\pi t$ (E) $\theta = \theta_{max} \sin 8\pi t$

Free Response Practice

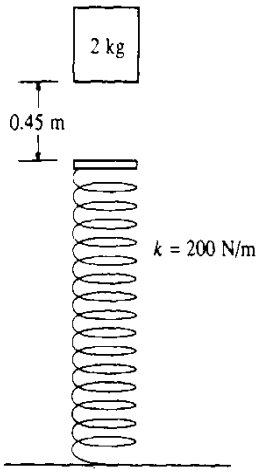
3. An object vibrating at the end of a horizontal spring is described by the position equation:

$$x = (0.255\ \text{m})\ \cos\left(\frac{\pi}{8.00} t\right)$$

   a. Find the amplitude, frequency, and period of motion for an object vibrating at the end of a horizontal spring if the equation for its position as a function of time is the following.

   b. Find the maximum magnitude of the velocity and acceleration.

   c. What is the position, velocity, and acceleration of the object after 1.45 s has elapsed?



4. A 2-kilogram block is dropped from a height of 0.45 meter above an uncompressed spring, as shown to the right. The spring has an elastic constant of 200 newtons per meter and negligible mass. The block strikes the end of the spring and sticks to it.

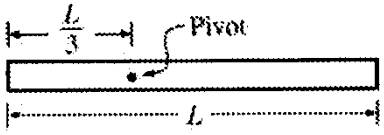
a. Determine the speed of the block at the instant it hits the end of the spring.

b. Determine the period of the simple harmonic motion that ensues.

c. Determine the distance that the spring is compressed at the instant the speed of the block is maximum.

d. Determine the maximum compression of the spring.

e. Determine the amplitude of the simple harmonic motion.



5. A uniform rod of mass M and length L is attached to a pivot of negligible friction as shown above. The pivot is located at a distance L/3 from the left end of the rod. Express all answers in terms of the given quantities and fundamental constants.

a. Calculate the rotational inertia of the rod about the pivot

b. The rod is then released from the horizontal position above. Calculate the linear speed of the bottom end of the rod when the rod passes through the vertical.

c. The rod is brought to rest in the vertical position shown above and hangs freely It is then displaced slightly from this position. Calculate the speed of oscillation as it swings.