PHYSICS 190: MECHANICS and HEAT; Lab 9: Simple Harmonic Motion

Part 1 (static determination of spring constant)

1. Set up

   a. Materials needed: slotted masses with mass hanger, table clamp, rod, pendulum clamp and brass spring
   b. Assemble simple harmonic motion apparatus (slotted masses with mass hanger, table clamp, rod, pendulum clamp and brass spring)

2. Measurements

   a. Attach 0.1 kg to the spring (this is to stretch the spring just a little and to establish the equilibrium point)
   b. Record amount spring stretches from the equilibrium point when an additional 0.05 kg mass is attached to the spring
   c. Repeat step "2 b" until you have 0.5 kg hanging from the spring

3. Analysis

   a. Using Logger Pro's curve fitting routine fit a sine curve to the distance vs. time graph
   b. Record angular frequency from the sine curve equation

Part 2 (dynamic determination of spring constant)

1. Set up

   a. Materials needed: Motion Detector, Universal Lab Interface (ULI), computer with Logger Pro software, slotted masses with mass hanger, table clamp, rod, pendulum clamp, brass spring, ring stand and wire screen
   b. Attach Motion Detector, to ULI using port 2
   c. Activate Logger Pro, select file from menu, select open, click on Tutorial, click on Motion Tutorial, click on open
   d. Set up graph for distance vs. time and velocity vs. time by clicking on y axis label, in the dialog box click on the appropriate boxes
   e. Assemble simple harmonic motion apparatus (slotted masses with mass hanger, table clamp, rod, pendulum clamp and brass spring)
   f. Position the motion detector above the hanging mass
   g. Position the ring stand and wire screen between the detector and the hanging mass (this is to protect the detector in the case of a falling mass)

2. Measurements

   a. Record amount of mass hanging from spring
   b. Release from about 10 cm above its equilibrium point
   c. Using the Motion Detector and Logger Pro to produce the distance and velocity graphs for oscillating mass

3. Analysis

   a. Using Logger Pro's curve fitting routine fit a sine curve to the distance vs. time graph
   b. Record angular frequency from the sine curve equation
   c. Calculate the spring constant

4. Questions

a. What is the value of the spring constant when measured statically?
b. What is the value of the spring constant when measured dynamically?