1. A spring is used to connect a block to a
    wall. (Neglect the mass of the spring, and
    assume the surface is frictionless.)

    A student moves the block 0.5 m to the right
    of its equilibrium position and at a certain
    instant (instant 1) releases it from rest. The
    subsequent motion of the block is shown.
    (The diagrams show the position of the
    block at time intervals 0.1 s apart.)

    a. What is the period of motion of the
        block? Explain how you can tell.

    b. Suppose that the student repeated the
        experiment shown here, except with one
        change to the setup.

        For each change listed below, how (if at
        all) would that change affect the period
        of motion? Be as specific as possible in
        your answers. Explain your reasoning.

        • The block is released 0.3 m to the
          right of equilibrium.

        • The spring is replaced with a stiffer spring.

        • The block is replaced with another block with four times the mass as the original one.

(Continued on other side)

2. Two simple harmonic oscillators (1 and 2) move with equal amplitudes and equal frequencies, as illustrated in the *x vs. t* graph provided.

a. What is the phase difference between the motions of oscillator 1 and oscillator 2? (Express your answer as a number of degrees not larger than 180°, or as a number of radians not larger than π.) Explain how you can tell.

b. Is oscillator 2 *ahead of* or *behind* oscillator 1 by the amount you specified in part a above? Explain how you can tell.