

Physics 200B
Lab 12 Homework

Name: _____

As usual, ignore friction and air resistance in all these questions.

1. To test the effects of varying acceleration on a microorganism, a container full of them is to be vibrated in simple harmonic motion. This is accomplished by attaching the container to a spring and setting it vibrating with an amplitude of 15 cm. The frequency of vibration is 0.5 Hz. Halfway through the experiment, the person in charge of the experiment doubles the amplitude without changing anything else.

a) Does the frequency increase, decrease, or stay the same? If it changes, by what factor does it change?

b) Does the time it takes to complete one cycle increase, decrease, or stay the same? If it changes, by what factor does it change?

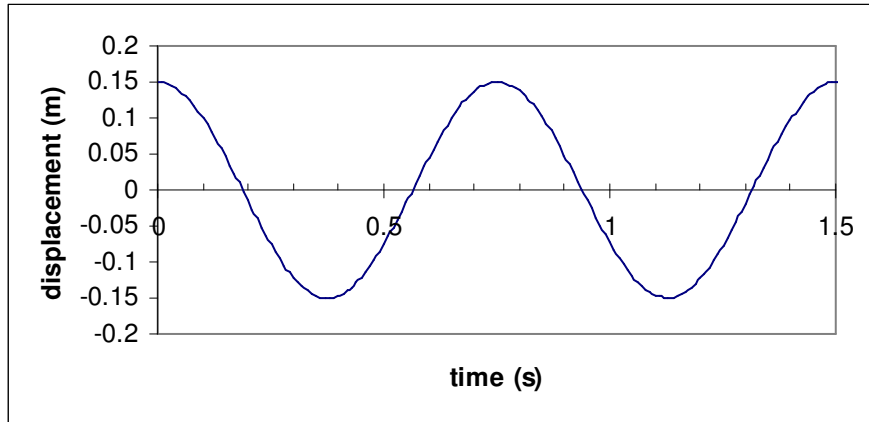
c) Does the maximum speed increase, decrease, or stay the same? If it changes, by what factor does it change?

d) Does the maximum acceleration increase, decrease, or stay the same? If it changes, by what factor does it change?

e) Does the total energy increase, decrease, or stay the same? If it changes, by what factor does it change?

2. You have two different springs available in the lab. When a weight is hung from spring 1 in equilibrium, the spring stretches 30 cm. When the same weight is hung from spring 2, it stretches 60 cm. Which spring will make the weight oscillate with a higher frequency? Explain your reasoning.

3. A can of paint of mass 2.0 kg is placed on the end of a spring and allowed to move back and forth in simple harmonic motion in order to mix the paint. A graph of the can's displacement vs. time is shown below. The spring's mass is negligible in comparison to the can's mass.



- What is the amplitude of the motion?
- What is the frequency of the motion?
- Write an equation for the can's displacement as a function of time, filling in the proper numerical values.
- What is the value of the spring constant in N/m?
- At what time(s) does the can feel a maximum force in the positive direction? What's the value of that force?
- At what time(s) does the can feel zero force?
- At what time(s) is the can's kinetic energy a maximum?
- If a spring was used that had the same spring constant but a mass that's not small compared to the can's mass, would the frequency of oscillation be higher, lower, or the same? Explain briefly.