Simple Harmonic Motion

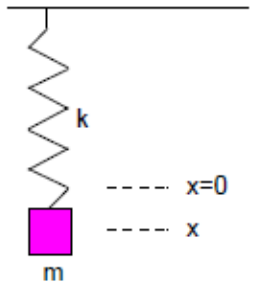
Procedure:
Your task today is to <u>experimentally</u> answer the questions posed for three simple harmonic oscillators: mass on a spring, simple pendulum and pasta with raisins.

- Your write up must include an answer to each question theoretically (according to the equations), and why you think this.
- Your write up must also include a clear description of how you experimentally answered these questions written so that a fellow classmate who has not done the lab, could reproduce your results exactly!
- Include data.
- Your results must be convincing, which means one example will not adequately support your answer.

I. Mass Attached to a Spring

The motion of a mass attached to a spring is *simple harmonic motion* if:

1. there is no friction and
2. if the displacement of the mass from its equilibrium position at $x = 0$ is "small". The displacement must be small enough so that the spring is not stretched beyond its elastic limit and becomes distorted.



The period of a spring/mass system undergoing simple harmonic motion is described by:

$T = 2\pi\sqrt{\frac{m}{k}}$, notice T and m are not linearly related.
Period and frequency have the relationship, $T = 1/f$

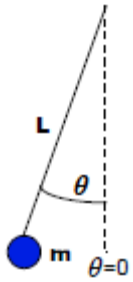
Materials and equipment available: big spring, weight hanger, masses, stop watch, motion detector, and Logger Pro interface and software.

A. ***Does the period of the motion depend on the amplitude?***
B. ***Does the period of the motion depend on the mass?***

II. Simple Pendulum

The motion of a pendulum can be treated as simple harmonic if:

1. there is no friction and
2. if the displacement of the mass m from the equilibrium position is small, $\theta \leq 15°$



The period of a pendulum undergoing simple harmonic motion is described by:

$T = 2\pi\sqrt{\frac{L}{g}}$, notice T and L are not linearly related.

Period and frequency have the relationship, $T = 1/f$

Procedure

Materials and equipment available: masses, string, stopwatch or other type of timer.

A. ***Does the period of the motion depend on the mass?***
B. Does the period of motion depend on the Length?

III. Pasta and Raisins/Marshmallows

Place a raisin or marshmallow on the end of a stick of spaghetti. Shake your hand back and forth to make the pasta/raisin system oscillate.

A. Does the period depend on the mass?
B. Does the period depend on the length?

Additional Questions:

a) Do you think this system's motion would fall under the classification of *simple harmonic motion?* Provide as much evidence as you can for your answer.
b) Do your answers to A and B above match a spring/mass system or a pendulum? How so?
c) Do you think this system can be modeled as a pendulum, spring, or neither? What are your reasons for each?