Lab # 2 – Simple Harmonic Motion

Purpose – To determine how mass and spring constant affects the frequency of an oscillating spring.

Procedure:

Part I – Effect of mass on the frequency of a spring oscillator system.

1. Move the cart about 20 cm to the left or right, and then release it from rest.
2. Measure the time it takes for the cart to move back **AND** forth 10 times.
3. Repeat with the masses indicated on the table below.
4. Graph the results.

Part II – Effect of spring constant on frequency of a spring oscillator system.

1. Measure the height of the bottom part of the un-stretched spring.
2. Place the 1 kg mass on it allowing the spring to expand slowly until it reaches equilibrium.
3. Measure the new height of the bottom of the now stretched spring.
4. Pull the 1 kg mass further down, and then release it allowing it to oscillate.
5. Measure the time it takes for the mass to move up **AND** down 10 times.
6. Record the results.

Data – Fill out the data sheet on the reverse side of this page.

Graph – Use the graph given in the back of this sheet to draw a large best-fit **CURVE**.

Calculations – (only needed for part II)

1. Measured frequency
2. Elongation
3. Weight of 1 kg mass
4. Spring constant
5. Calculated frequency: $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$
6. $\%\ Error = \frac{frequency\ (measured)\ -\ frequency\ (calculated)}{frequency\ (calculated)} \times 100$

Conclusion:

1. Explain why the graph you got in part I should look the way it does.
2. As the mass in part II moves up and down, where does it have its greatest:
    a. Kinetic energy
    b. Gravitational potential energy
    c. Elastic potential energy
3. Give a short explanation of EACH of your answers to number 2.
4. List at least one source of error for part II of the experiment.

Data:

Part I

	Trial	Mass (kg)	Time for 10 oscillations(sec)	Frequency (Hertz, Hz)
1	Empty cart	0.250 kg		
2	Cart + 250 g			
3	Cart + 500 g			
4	Cart + 750 g			
5	Cart + 1000 g			

Part II

Time for 10 oscillations	s
Measured Frequency (Hertz)	Hz
Height of un-stretched spring	m
Height of stretched spring	m
Elongation	m
Weight of the 1 kg mass	N
Spring constant of spring	N/m
Calculated Frequency (Hertz)	Hz
% Error	%

Graph: