Name: ___________________________

Elastic Potential Energy Lab Activity
SPH4C

<u>Materials</u>: 5 N, 20 N, and 50 N spring scales, various masses, ruler

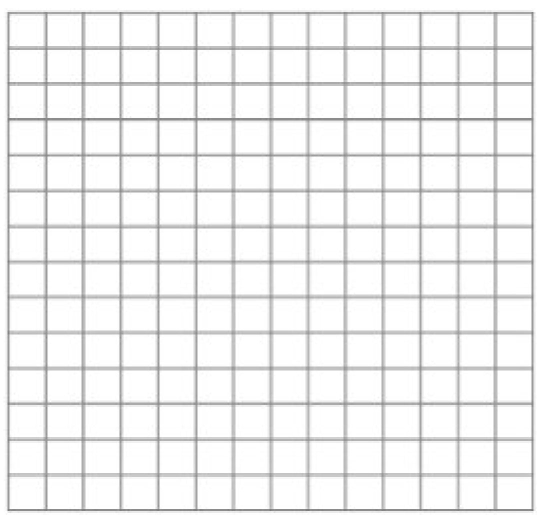
<u>Part 1: The Spring Constants</u>

1. Suspend a 100 g mass from the 5 N spring scale. Record the weight of the mass in Table 1 below.
2. Use the ruler to measure the extension (stretch) of the spring scale. Record this extension in *metres* (not centimetres) in Table 1 below.
3. Repeat Steps 1 and 2 for masses of 200 g, 300 g, 400 g, and 500 g. (For the 300 g mass, use a mass of 200 g + a mass of 100 g, etc.)

Table 1: Extension of 5 N Spring Scale When Various Weights Are Suspended From It

Weight (N) $F_g = mg$					
Extension (m)					

4. Graph your force-extension data. (Force should go on the vertical axis, extension on the horizontal.)



5. Calculate the slope of your line of best fit to determine the spring constant of the spring of the 5 N spring scale.

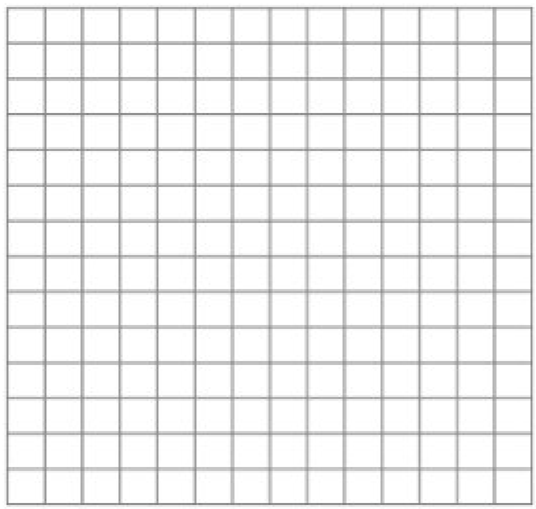
$$slope = k = \frac{F_2 - F_1}{x_2 - x_1} =$$

6. Suspend a 500 g mass from the 20 N spring scale. Record the weight of the mass in Table 2 below.
7. Use the ruler to measure the extension (stretch) of the spring scale. Record this extension in *metres* (not centimetres) in Table 2 below.
8. Repeat Steps 6 and 7 for masses of 1000 g, 1500 g, and 2000 g.

Table 2: Extension of 20 N Spring Scale When Various Weights Are Suspended From It

Weight (N) $F_g = mg$				
Extension (m)				

9. Graph your force-extension data. (Force should go on the vertical axis, extension on the horizontal.)



10. Calculate the slope of your line of best fit to determine the spring constant of the spring of the 20 N spring scale.

$$slope = k = \frac{F_2 - F_1}{x_2 - x_1} =$$

Is the spring of the 20 N spring scale easier to pull or more difficult to pull than that of the 5 N spring scale?

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Is the spring constant of the 20 N spring scale larger or smaller than that of the 5 N spring scale?

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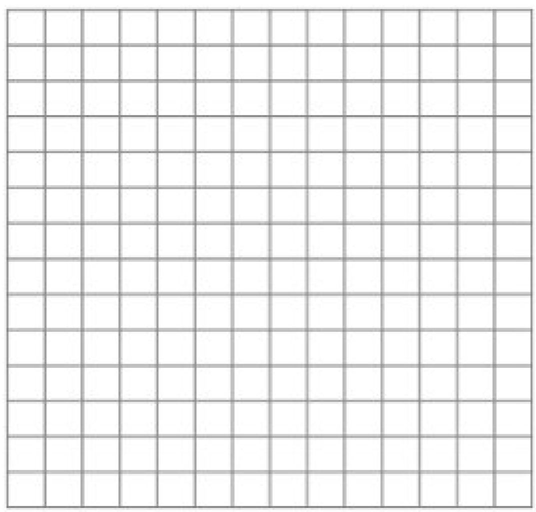
11. Suspend a 1000 g mass from the 50 N spring scale. Record the weight of the mass in Table 1 below.
12. Use the ruler to measure the extension (stretch) of the spring scale. Record this extension in *metres* (not centimetres) in Table 1 below.
13. Repeat Steps 11 and 12 for masses of 2000 g, 3000 g, 4000 g, and 5000 g (if possible).

Table 3: Extension of 50 N Spring Scale When Various Weights Are Suspended From It

Weight (N) $F_g = mg$					
Extension (m)					

14. Graph your force-extension data. (Force should go on the vertical axis, extension on the horizontal.)



15. Calculate the slope of your line of best fit to determine the spring constant of the spring of the 50 N spring scale.

$$slope = k = \frac{F_2 - F_1}{x_2 - x_1} \quad =$$

Is the spring of this spring scale easier to pull or more difficult to pull than those of the others?

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Is the spring constant of this spring scale larger or smaller than that of the others?

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<u>Conclusion</u>: The more difficult a spring is to pull, the ________________ its spring constant is.

Part 2: Energy Transformations

Given your spring constants *k* for each spring scale, calculate the elastic potential stored in the spring and the decrease in gravitational potential of the mass for each of your trials. (Remember that $\Delta h = -x$.)

Table 4: E_e *and* ΔE_g *for the 5 N Spring Scale*

Elastic Potential (J) $E_e = \frac{1}{2} k x^2$					
Gravitational Potential (J) $\Delta E_g = m g \Delta h$					

Table 5: E_e *and* ΔE_g *for the 20 N Spring Scale*

Elastic Potential (J) $E_e = \frac{1}{2} k x^2$					
Gravitational Potential (J) $\Delta E_g = m g \Delta h$					

Table 6: E_e *and* ΔE_g *for the 50 N Spring Scale*

Elastic Potential (J) $E_e = \frac{1}{2} k x^2$					
Gravitational Potential (J) $\Delta E_g = m g \Delta h$					

What can you conclude?

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