Name: ____________________________ Date: _____________________________

# Hooke's Law Lab

Part I – Single Spring

Hang 25 grams from a single spring, and measure the distance from the hanging mass to the bench top. This will be the ZERO point. All subsequent measurements of displacement should be measured with respect to the ZERO point. Complete the table below, and answer the questions.

| Total Mass on Spring (kg) | Mass that caused the displacement (kg) | Force that caused the displacement (N) | Displacement (Distance from ZERO point) (m) |
|---|---|---|---|
| 0.025 | 0.000 | 0.0 | 0.00 |
| 0.035 | 0.010 | 0.1 | |
| 0.045 | 0.020 | 0.2 | |
| 0.055 | 0.030 | 0.3 | |
| 0.065 | 0.040 | 0.4 | |
| 0.075 | 0.050 | 0.5 | |

How was the "Force that caused the displacement" determined?

Create a Scatter Plot of "Force that caused the displacement" versus Displacement (Y vs X), and fit the data with a linear fit. Include the ZERO point in your data. Show the equation of the line on the graph.

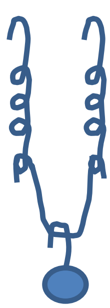
Determine the value of the slope, and explain what the slope of the line represents?

Part II -- Predictions

Without actually hanging masses from the following spring set-ups, make your predictions and discuss with your lab group.

If you are given a second spring that is identical to your first spring and the two identical springs are combined in series as shown in the diagram below, determine the approximate displacement if a ***total*** of 65g is hung from the bottom spring. Explain your reasoning. Assume that the zero mark is established using 25g. (HINT: Does the top spring know about the bottom spring?)

If you combine the two identical springs in parallel as shown in the diagram below, determine the approximate displacement if a ***total*** of 65g is hung from the springs. Explain your reasoning. Assume that the zero mark is established using 25g.



Part III – Two Springs in Series

Complete the table below, and add the data to your Scatter Plot as a separate data set. Include a Linear fit and the equation of the line.

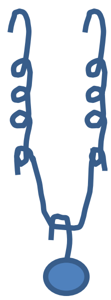
| | Total Mass on Spring (kg) | Mass that caused the displacement (kg) | Force that caused the displacement (N) | Displacement (Distance from ZERO point) (m) |
|---|---|---|---|---|
|  | 0.025 | 0.000 | 0.0 | 0.00 |
| | 0.035 | 0.010 | 0.1 | |
| | 0.045 | 0.020 | 0.2 | |
| | 0.055 | 0.030 | 0.3 | |
| | 0.065 | 0.040 | 0.4 | |
| | 0.075 | 0.050 | 0.5 | |

Comment on how the the slope of the line for the springs in series and the single spring are related.

What is the spring constant for the Series combination?

Part IV – Two Springs in Parallel

Complete the table below, and add the data to your Scatter Plot as a separate data set.  Include a Linear fit and the equation of the line.

| | Total Mass on Spring (kg) | Mass that caused the displacement (kg) | Force that caused the displacement (N) | Displacement (Distance from ZERO point) (m) |
|---|---|---|---|---|
|  | 0.025 | 0.000 | 0.0 | 0.00 |
| | 0.035 | 0.010 | 0.1 | |
| | 0.045 | 0.020 | 0.2 | |
| | 0.055 | 0.030 | 0.3 | |
| | 0.065 | 0.040 | 0.4 | |
| | 0.075 | 0.050 | 0.5 | |

Comment on how the the slope of the line for the springs in parallel and the single spring are related.

What is the spring constant for the Parallel combination?