Hooke's Law       Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Purpose: To verify Hooke’s law and determine the spring constants of elastic springs.

Apparatus: 3 springs, pendulum clamp, motion sensor, plumb-line, meter stick, tall lab stand, mass set, and mass hanger.

Theory: Think about stretching a spring. The more stretching force you apply, the more stretch you get. Robert Hooke (1635-1703), a British physicist, discovered this empirical relationship between the restoring force (F) and the stretch (x), known as Hooke's law,   
F = - kX.





According to Hooke's law, the magnitude of the stretching force is given by:  
   
 Stretching Force = (Spring constant) X Stretch.  
  
The stretching force is provided by the added mass. You can also plot Stretching Force VERSUS Stretch. Hooke’s law is verified when there is a linear relationship between Stretching Force & Stretch.

The Spring Constant is given by the slope of the Stretching Force versus Stretch graph.

Procedure:  
1. Attach the mass hanger to the hard spring and hang it from the pendulum clamp.  
2. Set up the motion sensor about 50-cm below the bottom of the mass hanger, using a plum-line.  
3. Connect the motion sensor to the interface (yellow-1, black-2), set the beam to narrow.  
4. Setting up the Interface for data collection:  
 a. Open **PASCO Capstone** software from the desktop.   
 b. Click **Hardware Setup** under Tools on the left, click on the interface input  
 where the sensor is connected and select **Motion Sensor II**.   
 Click **Hardware Setup** again to close it.   
 c. Double-Click **Digits** under Displays on the right, click Select Measurement, and select  
 **Position.**    
5. Click **Record** and record the distance to the bottom of mass hanger from the motion sensor. Stop the data collection.  
6. Add an appropriate mass to make the spring stretch about 2 cm and measure the distance to the bottom of mass hanger, again, and record it.  
7. Measure the stretches for other added masses and complete the data table.  
8. Repeat 1-7 for the other two springs.  
9. Enter the above data in Excel and for each spring; create two more columns for Stretch (m) and Stretching force (N). Calculate these values and make a single XY scatter Plot Stretching force VS. Stretch for all three springs, and find the spring constant for each spring.  
10. Attach your data table & plot (Excel) and conclusion (Word).

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| [SAMPLE DATA](file:///C:\Users\mahesp\AppData\Local\Temp\Hooke.xlsx) | | | |  | | | |  | | | |  |
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