| Hooke's Law PhET Lab | **Lab Write-up** Purpose Procedure Data Calculations/Graph Questions | Name _____ Hour _____ |

Purpose:

1. To investigate Hooke's Law (The relation between force and stretch for a spring) $F = -kx$
2. To re-visit Newton's 3rd Law of Motion.

Discussion:

Everybody knows that when you apply a force to a spring or a rubber band, it stretches. A scientist would ask, "How is the force that you apply related to the amount of stretch?" This question was answered by Robert Hooke, a contemporary of Newton, and the answer has come to be called Hooke's Law.

Hooke's Law, believe it or not, is a very important and widely-used law in physics and engineering. Its applications go far beyond springs and rubber bands.

You can investigate Hooke's Law by measuring how much known forces stretch a spring. A convenient way to apply a precisely-known force is to let the weight of a known mass be the force used to stretch the spring. The force can be calculated from $W = mg$. The stretch of the spring can be measured by noting the position of the end of the spring before and during the application of the force.

Equipment:

PhET Simulation "Springs and Masses" from http://phet.colorado.edu/

Procedure:

1. Go to PhET webaddress and run Springs and Masses.
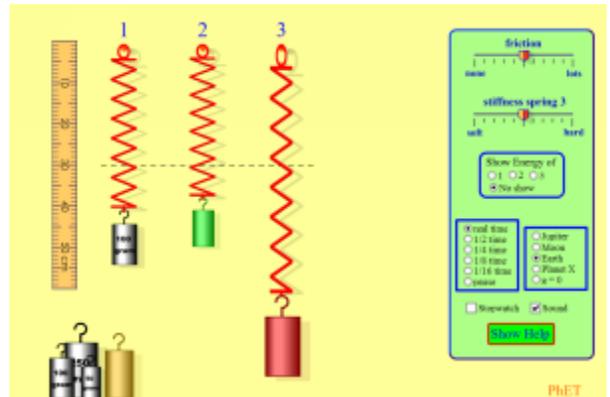
2. Construct a data table in lab book. You will need to record the mass that you hang from the spring and the change in position of the end of the spring before and after the mass is added.

Trial	mass (g)	mass (kg)	Displacement (cm) (stretch)
1			
2			
3			

3. From this, you will calculate the force applied to the spring. You will do three trials using Spring #3, set to the default setting for stiffness of the spring. Place each of the masses from the spring and record you data (A sample data table is shown above.)

4. For each trial, record the mass, the starting position of the spring (before hanging the mass) and the ending position of the spring (while it is being stretched) and record the change in position as displacement.

5. Repeat the process using spring #3 but set the stiffness to hard.

Calculations:

1. Calculate the force applied to the springs in each trial (W = mg) Use g = 9.803 m/s^2. Mass must be in kg when converting to N

2. Draw graphs (you may use Graphical Analysis) of **force versus stretch for the spring and the spring set to hard**. You may be able to put both graphs on the same sheet of graph paper, depending on the data. Find the slope of each line on graph.

Questions:

1. Imaging hanging an object (at rest) from the spring scale. Draw a set of diagrams that shows all of the forces that act:

        A. on the object?   B. on the clamp?

2. What is the net force on:

        A. the object?   B. the clamp?

3. Are the forces that act on the object equal and opposite? Are they a Newton's Third Law force pair? Explain.

4. Are the forces that act on the clamp equal and opposite? Are they a Newton's Third Law force pair? Explain.

5. What is the relationship of the force on the spring and stretch of the spring?

6. What does the slope of the graph represent?

7. What is a real-world application of Hooke's Law used in class? *Hint: Think about lab instruments used in previous labs.*

Name_____

Date_____

Period_____

Score   GradeCam ID