PHYSICS NAME ______________________

LAB: **HOOKE'S LAW; STRESS vs. STRAIN IN A SPRING** DATE __________ PERIOD ___

RANGE OF A LAUNCHED SPRING

LAB PARTNERS: 1.__________________ 2._________________ 3._________________

PURPOSE:

(a) Find the relationship between stress and strain for a spring (Hooke's Law).
(b) Find the spring constant for a spring.
(c) Predict the range of a launched spring, and verify the prediction experimentally.

CAUTION: PLEASE DON'T RUIN THE SPRING! DON'T HANG MORE THAN 400 GRAMS ON A SPRING UNLESS YOU CHECK WITH ME! DON'T LET WEIGHTS MAKE LARGE BOUNCES ON THE SPRING!

PROCEDURE: SEE OTHER SIDE

DATA:

SPRING NUMBER: ________ <-----IMPORTANT!!!!!

PART 1: HOOKE'S LAW PART 2: RANGE OF LAUNCHED SPRING

F (N)	x (m)	* * * *		
			Spring Constant	N/m
0	0.000	* * * *	Mass of Spring	kg
1		* * * *	Amount of Stretch	m
2		* * * *	Predicted Range	m
3		* * * *	Actual Range	m
4		* * * *	% Error	%

CALCULATIONS:

$$\text{RANGE} = \frac{kx^2}{mg} =$$

$$\%\ \text{ERROR} = \frac{|R_A - R_P|}{R_P} \times 100 =$$

CONCLUSION/QUESTIONS:

1. Stress is _______________ _______________ to strain in a spring. This is known as Hooke's Law.

2. The spring constant for spring #__________ is __________N/m.

3. The predicted range for the spring was _____m. The actual range was _____m. The percent error was _____%.

PROCEDURE:

CAUTION: PLEASE DON'T RUIN THE SPRING! DON'T HANG MORE THAN 400 GRAMS ON A SPRING UNLESS YOU CHECK WITH ME! DON'T LET WEIGHTS MAKE LARGE BOUNCES ON THE SPRING!

PART1: HOOKE'S LAW

1. Set up the hanging spring as directed in class. The bottom of the lower hook on the spring should be exactly 50.0 cm above the lab table surface, so that the bottom of the hook reads 0.0 cm on a half-meter stick, and the table surface reads 50.0 cm. This corresponds to a reading of 0 N and 0.000 m in the table provided.

2. Hang a 1 N weight on the spring. Record the force as 1 N, and the record the new position of the bottom of the spring to the nearest 0.001 m.

3. Repeat step 2 three more times, for 2N, 3N, and 4 N.

4. Make a graph of force vs. stretch. Label the y-axis **F** with units of **Newtons**, and label the x-axis **x**, with units of **meters** on x-axis. Plot by hand on graph paper, or use graphing program on computer. Be sure to use (0,0) as first point.
(a) If the graph is done on the computer, use POINT PROTECTORS, REGRESSION LINE and STATISTICS.
(b) If the graph is done by hand, show a slope triangle with values for rise and run (including units), and show a sample calculation for the slope (including units).
(c) INDICATE SPRING NUMBER ON GRAPH, whether done by hand or on computer.

PART 2: RANGE OF A LAUNCHED SPRING

5. The following equation can be used to predict the range of a launched spring. The equation will be derived and/or discussed in class. (This is an equation specific to this lab, for a 45° launch.)

$$R = \frac{kx^2}{mg}$$

k = the "spring constant" for the spring, in **N/m** (the value of the slope)
x = the amount the spring is stretched, in **m**
m = the mass of the spring, in **kg**
g = 9.8 m/sec2

6. Record the value of the spring constant (slope value, in **N/m**) in the table.

7. Determine the mass of the spring. Record to nearest 0.0001 **kg** in the table.

8. Choose a stretch distance between 10.0 cm and 20.0 cm. If your spring is "weak," choose a stretch nearer 20.0 cm. If your spring is "stiff," choose a stretch nearer 10.0 cm. See me for advice if you are in doubt. Record the stretch to the nearest 0.001 **m** in the table.

9. Use the values for mass and stretch, along with the spring constant value and the g value, to calculate the predicted range of the spring from the equation above. Complete the sample calculation which has been started, and record the predicted range in the table.

10. Set up the launching apparatus and launch the spring. Record the actual range in the table.

11. Complete the sample calculation for percent error which has been started, and record the percent error in the table.