

PURPOSE:

- (a) Find the relationship between stress and strain for a spring (Hooke's Law) (b) Find the spring constant for a spring and (c) use the spring constant ($= k$) to do some potential energy calculations

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!

- 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 data table provided below.
- 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.
- Repeat step 2 three more times, for 2N, 3N, and 4 N.
- Use the graphing program on the computer to make a graph of force vs. stretch. (The words used in physics and engineering for force and stretch are stress and strain.)
 - Label the y-axis **F**, with units of **Newtons**, and label the x-axis **x**, with units of **meters**.
 - Be sure to use (0,0) as the first point.
 - When plotting the graph, use POINT PROTECTORS, REGRESSION LINE and STATISTICS.
 - INDICATE THE SPRING NUMBER ON THE GRAPH (write it in by hand after the graph is printed).

DATA:

SPRING NUMBER: _____ <-----IMPORTANT!!!!

F (N)	0.0	1.0	2.0	3.0	4.0
x (m)					

CONCLUSION/QUESTIONS:

- The straight line graph indicates that stress is _____ to strain in a spring. This relationship is known as Hooke's Law.
- The value of the slope of the stress-strain graph is known as the spring constant. The spring constant for
 spring #_____ is _____N/m.
- The spring constant is a measure of the stiffness of a spring, or how hard it is to stretch a spring. The stiffer the spring, or the harder it is to stretch it, the **< larger >** **< smaller >** the spring constant.
- If the potential energy stored in a spring is: $PE = \frac{1}{2} kx^2$ and the gravitational potential energy of a hanging weight is $PE = mgh$, at what value of x will a weight hang on the spring ? Compare your calculation results with the actual position of a hanging weight. (Use $m = 200$ grams)

Calculated: _____ Actual: _____

5. Calculate how high will a launched spring go if shot vertically (use $x = 10$ cm). Use the expressions above for PE to do this calculation (note: you will need to know the mass of the spring = _____). Launch the spring and compare the calculated result with the actual height of the launched spring.

Calculated: _____ Actual: _____