NAME_____ DATE_____
PHYSICS A/R -- PERIOD ____ MR. LEACOCK

LABORATORY 18
HOOKE'S LAW LABORATORY

OBJECTIVE

TO DETERMINE HOW THE ELONGATION OF A SPRING IS RELATED TO THE FORCE WHICH IS PLACED UPON IT.

METHOD

1. HOOK THE WEIGHT HANGER ONTO THE LOWER LOOP OF THE SPRING, IF NECESSARY.
2. CAREFULLY NOTE WHERE ON THE SCALE THE POINTER INDICATES AND RECORD THIS ON YOUR DATA TABLE. (You may find it easier to slide your scale so it starts at zero.)
3. ADD 50, 100, 150, 200 AND 250 GRAMS TO THE WEIGHT HANGER, RECORD THE TOTAL MASS ON THE SPRING, AND RECORD THE POSITION OF THE POINTER.
4. COMPLETE THE DATA TABLE. THE FORCE EXERTED BY GRAVITY ON THE HANGING MASS IS CALCULATED BY $w=mg$, WHERE w IS THE WEIGHT, WHICH IS A FORCE, m IS THE MASS IN KILOGRAMS, AND g IS THE ACCELERATION OF GRAVITY, 9.8 m/s^2.
5. GRAPH THE DATA AS FORCE IN NEWTONS (Y-AXIS) VS. ELONGATION IN METERS (X-AXIS).
6. PLOT THE BEST FITTING STRAIGHT LINE THROUGH THE POINTS. **THE LINE DOES NOT HAVE TO GO THROUGH THE ORIGIN.** ONCE YOU HAVE PLOTTED THE LINE FIND THE SLOPE OF THE LINE.
7. PLACE 120 GRAMS ON THE WEIGHT HANGER. WRITE THE ELONGATION BELOW.

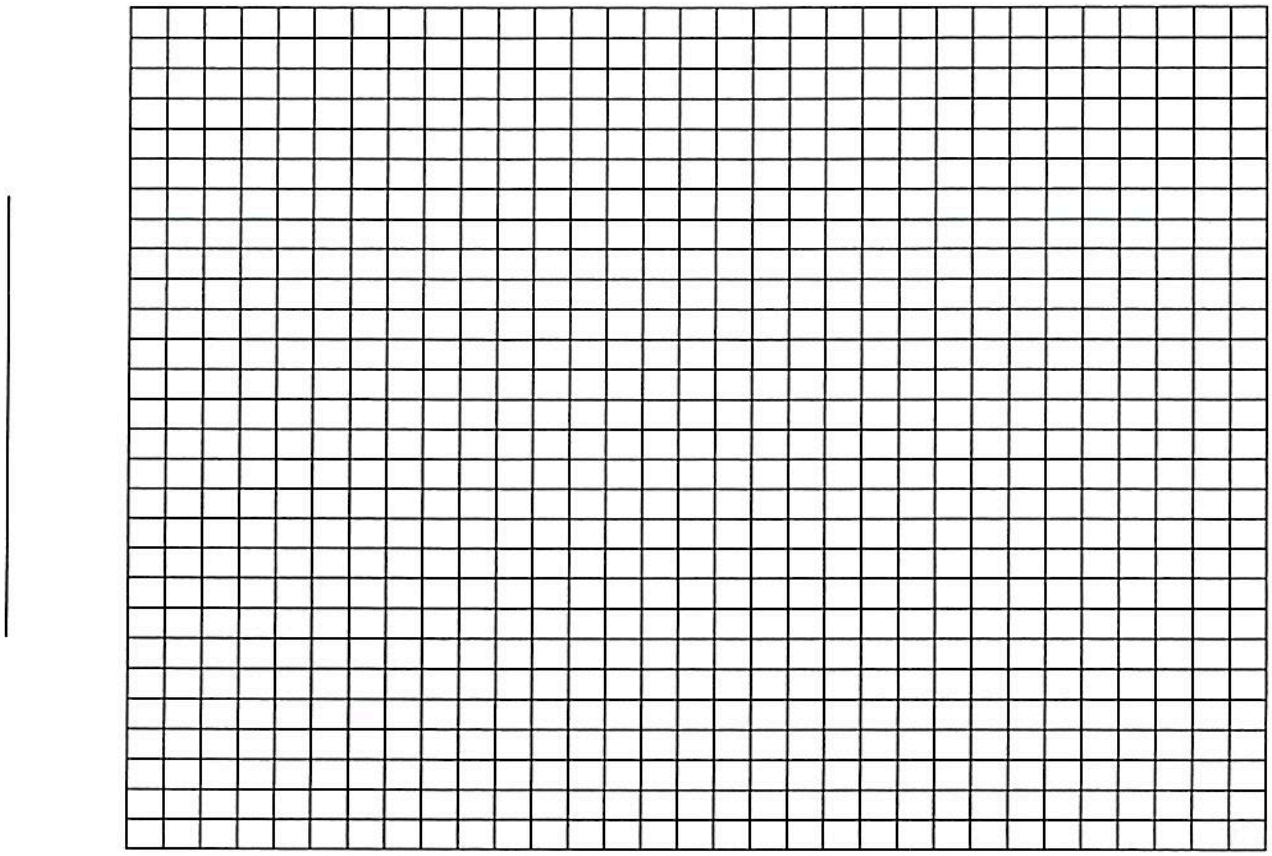
Elongation of a spring with 120g attached = _____cm.

DIAGRAM

DRAW A SKETCH OF THE HOOKE'S LAW APPARATUS HERE.

DATA

Mass (g)	Mass (kg)	Force (Newtons)	Elongation (cm)	Elongation (m)
50 g				
100 g				
150 g				
200 g				
250 g				



QUESTIONS

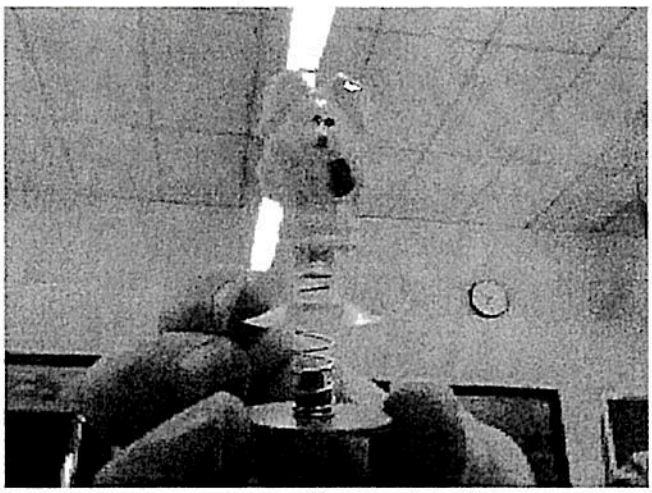
1. USING YOUR GRAPH, FIND THE ELONGATION OF YOUR SPRING WHEN A 120 g MASS IS HUNG FROM THE SPRING.

2. FIND THE PERCENTAGE ERROR USING YOUR ANSWER FROM QUESTION #1 AS YOUR EXPERIMENTAL VALUE AND YOUR ANSWER FROM STEP 7 AS YOU ACTUAL VALUE.

$$\%\ ERROR = \frac{EXPERIMENTAL - ACTUAL}{ACTUAL} \times 100\%$$

3. THE EQUATION FOR A STRAIGHT LINE IS $y=mx+b$, WHERE m IS THE SLOPE OF THE LINE AND b IS THE Y-INTERCEPT. THE EQUATION FOR THE ELONGATION OF A SPRING IS $F=kx$, WHERE F IS THE APPLIED FORCE ON THE SPRING, k IS THE SPRING CONSTANT, AND x IS THE ELONGATION OF THE SPRING. USING YOUR GRAPH, CAN YOU FIND ANY RELATIONSHIPS BETWEEN THESE TWO FUNCTIONS. **HINT -- THE Y-INTERCEPT IS UNIMPORTANT.**

Part 2 – Potential energy



Take a toy popper, compress it and wait for it to pop up into the air. Using your understanding of energy exchanges, take the appropriate measurements to determine the spring constant of the popper. You may use balances, rulers, and stopwatches to make you determination.