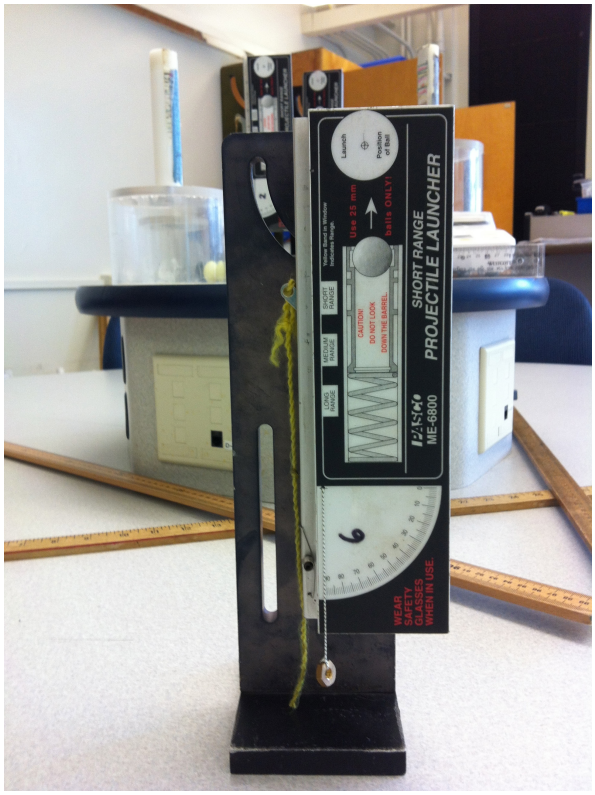
Work Done by Spring

Equipment:

- per group: projectile launcher + ball, safety glasses, meter sticks, rulers
- per table: digital mass balance



Explorations

Using the projectile launcher, shoot a ball vertically and determine the maximum height h_{max} reached by the projectile for the low and medium settings of the compression (*do not use the high setting because the fluorescent ceiling bulbs are vulnerable*). Think about what position to refer to as the correct zero compression – refer to the warmup for clues.

- Record your data for all distances (heights and compressions). Perform several trials for each setting so that you can determine uncertainties. Determine the best values for each setting together with an appropriate uncertainty and put those values (with units!) in your lab notebook in a table like that shown below (with uncertainties):

	compression Δy	maximum height h_{max}
Low setting		
Medium setting		

- Based on the details of your warmup solution, determine an expression (equation) for the effective spring constant, k, of your launcher.

- Measure the mass of the projectile and use your data for h_{max} and Δy (and the expression from the last bullet) to calculate a value for the effective spring constant for both the low and the medium setting (the spring constant is an *effective* value because it does not take into account the fact that the spring mechanism is not massless). Your TA will provide a table on the board to enter your group's values.

- Choose what you think is the best effective spring constant for your launcher as a whole, based on your low and medium measurements as recorded on the board, and predict the value of h_{max} for Δy corresponding to the high compression setting (measure Δy for your launcher on the high setting but do not use or launch a projectile). The instructor will compare the values obtained by various groups and will perform the experiment. Compare the value obtained in that experiment with your prediction and comment in your lab notebook.

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