Air Resistance

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Preliminary Questions

Hold a single coffee filter in your hand. Release it and watch it fall to the ground. Next, nest two filters and release them. Did two filters fall faster, slower, or at the same rate as one filter?

What kind of mathematical relationship do you predict will exist between the velocity of fall and the number of filters?

If there was no air resistance, how would the rate of fall of a coffee filter compare to the rate of fall of a baseball, for example?

Sketch the correct graph of the velocity vs. time for one falling coffee filter.

When the filter reaches terminal velocity, what is the net force acting upon it?

Measuring Air Resistance

Complete the table for the slope.

Table 1

Number of Filters	**Terminal Velocity (m/s)**	**(Terminal Velocity)^2 (m/s)^2**
One		
Two		
Three		
Four		
Five		

Upload your position vs. time graph. (Submit a file with a maximum size of 1 MB. *You will upload this file in the WebAssign question.*)

Draw the correct free body diagram.

Analysis

Upload your v_T vs. mass and v_T^2 vs. mass graphs. (Submit a file with a maximum size of 1 MB. *You will upload this file in the WebAssign question.*)

From your graphs, which proportionality is consistent with your data; that is, which graph is closer to a straight line that goes through the origin?

Which of the drag force relationships ($-bv$ or $-cv^2$) appears to model the real data better?

How does the time of fall relate to the weight (mg) of the coffee filters (drag force)?

If one filter falls in time, t, how long would it take four filters to fall, assuming the filters are always moving at terminal velocity? Explain.