**Union College Spring 2021**

**Physics 120 Lab 3: A study of Air Resistance**

In earlier labs, we made measurements of the motion of a projectile ignoring its interaction with the air. We know, though, that the force of air resistance can be significant, as a sheet of paper falls more slowly than a metal ball. In this lab, you will experimentally determine the strength of the force of air resistance.

One interesting (and useful) consequence of air resistance is the concept of **terminal speed**. As a body falls, at some point, it stops accelerating and falls at a constant speed – this is its terminal speed.

1. What is the net force acting on a body that is falling at terminal speed?

2. Take a flat-bottom coffee filter, stand on the table top, hold the coffee filter as high up as you can, right-side up, as it would be in a coffee maker. Let go of the coffee filter, letting it drop to the floor, and watch. Does it reach terminal speed? How quickly?

3. Now drop a pack of 4 coffee filters. Does the pack reach terminal speed?

4. Drop one coffee filter and pack of 8 at the same time. Do they reach the ground at the same time? Do they reach the same terminal speed?

5. Considering the answer to #1, calculate the magnitude of the force of air resistance in both cases. (There is a measurement that you’ll need to make to complete the calculation.)

6. Are the magnitudes of the air resistance forces the same?

7. Why might the strengths of air resistance forces in the two cases be different? What parameter(s) differs in the two cases that could have an effect on the force of air resistance? Obviously the masses of the falling bodies are not the same, but this is not a reasonable answer, since there is no reasonable explanation for how a body’s mass (without changing its size) affects the body’s interaction with air molecules. (Note that the physical size and shape of the falling objects are the same in both cases.) Hint: what is the force of air resistance on a coffee filter that is hanging by a string and not moving? When your group is confident in an answer tell your instructor. If your idea is good, your instructor will give you another handout with specific instructions.