Physics 110 **Spring 2026**

Lab 2: A Study of Air Resistance

Name: _____ Lab Partners: _____

Honor Code Statement: I affirm that I have carried out my academic endeavors with full academic honesty. _____

Introduction

In lab 1, 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 called the object's terminal speed.

Procedure

Part 1: General Observations

1. 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 its motion. Does it reach terminal speed? If it does, how quickly does it reach terminal speed?

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

3. List all the forces acting on the falling body?

4. Write the Newton's Second Law equation for this situation.

5. Now drop a pack of 4 coffee filters. Does the pack reach terminal speed? If so, how quickly? Sooner than the single filter? Later? Or the same?

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

7. What must the magnitude of the force of air resistance be equal to in each case? Hint: what is the net force acting on each? Are the magnitudes of the air resistance forces the same?

8. Considering your answers to the questions above, what quantity or quantities must the force of air resistance depend on? Hint 1: consider the very instant after you let go of the coffee filters, when its speed is zero; what is the force of air resistance then? Hint 2: Consider your own experience with air resistance. Imagine sticking your hand out of the window in a moving car; when is the force of air resistance on your hand is larger?

9. Why might the magnitudes of the air resistance forces in the two cases be different? Hint: Consider what condition must be met for a body to reach terminal speed.

When your group is confident in the answers above, tell your instructor. If your idea is good, your instructor will give you another handout with specific instructions for the experiment.