_____ # _____ AP Physics 1

Terminal Velocity

Introduction (Use your notes and the web to summarize, in a paragraph, what you know about terminal velocity. What is the net force and acceleration when an object reaches terminal velocity. Describe the kinds of objects that reach terminal velocity quickly. DO NOT use a list. Do this in a paragraph. **(10 pts)**

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Purpose (a) To determine the mathematical relationship between the terminal velocity of the coffee filter and its mass.

(b) To come up with an equation that relates mass and terminal velocity using $y = mx + b$

(c) To use your equation to predict the terminal velocity of 10 coffee filters

Materials

- 5 coffee filters
- Vernier Video Physics
- Meter stick

Plot - 20 pts
Procedure (5 pts)

1._____

2._____

3._____

4._____

<u>Data</u> (5 pts)

			^{2}
0	0	0	0

Terminal Velocity Analysis

(6 pts each) 2 pt deduction if sentence is not complete

1. Describe what happens to the motion of a falling body when it reaches terminal velocity?

2. Name two characteristics of objects that reach terminal velocity very quickly when falling in air.

3. All of your d vs t plots had essentially the same shape. Sketch the plot shape below. Be sure to label the section of your plot where the filter(s) reached terminal velocity

4. If you wanted to find the friction force on 2 filters after they've reached terminal velocity, how would you go about doing that? Use full sentences and support your answer w/ equation(s) and a free body diagram.

5. Explain how you found the terminal velocity from the d vs t plot you generated?

6. What was the mathematical relationship between the terminal velocity and the number of filters between 1 and 5 filters?

   The velocity of the filters were _____ to the

   _____ of the filter's mass.

7. When the filters reach terminal velocity, are they in dynamic or static equilibrium? Explain in a sentence or two. Support your explanation with equations.

8. Predict the velocity you would expect to get from coffee filters with a mass of 3.5. Show all your work on your graph. Locate the exact point on the graph that corresponds to your answer.

9. Using $F_{net} = ma$, find the relationship between m, f_k, and g for a coffee filter that has reached terminal velocity.

10. Predict the velocity you would get if you dropped 10 coffee filters. Show all calculations you performed to arrive at your solutions.