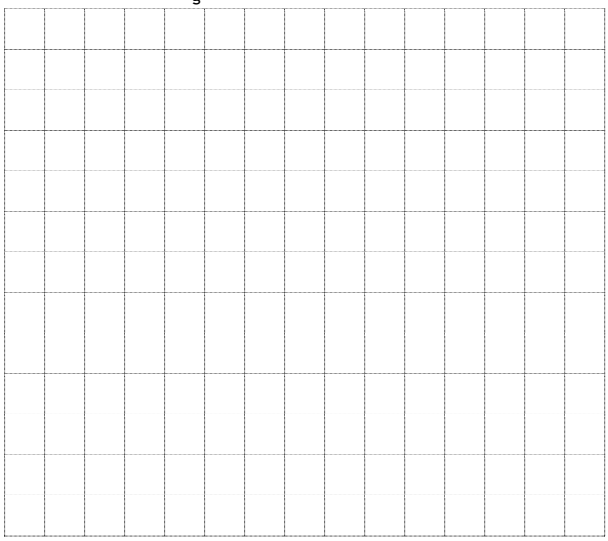
Physics Name:_____
Coffee Filter/Sky Diving

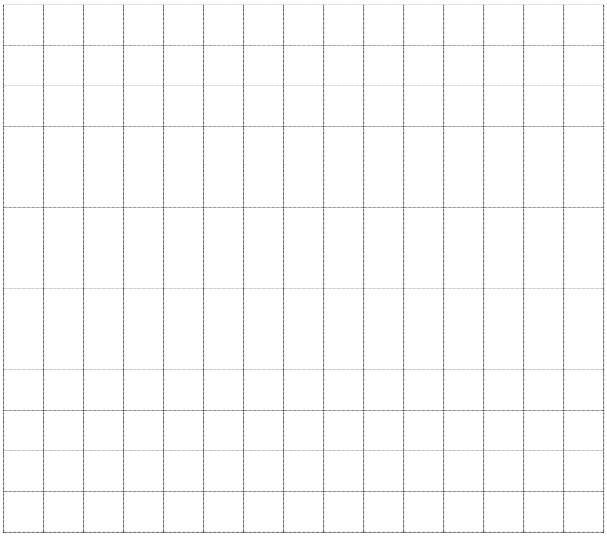
Purpose: To determine the relationship between air friction and mass for a body at terminal velocity.
Procedure: Use the data given in class and your knowledge of air resistance and Newton's Laws to complete the data table given.

# of Filters	Mass (kg)	Weight (N)	Air Resistance (N)	Distance (m)	Time (s)	Terminal velocity (M/s)

F_g vs m



$F_{A.R.}$ vs. v



1) Looking at your first graph, what is the relationship between F_g and m? circle one
INDEPENDENT DIRECT INVERSE SQUARED/POWER SQUARE ROOT INVERSE SQUARED

2) Looking at your second graph, what is the relationship between $F_{A.R.}$ and v? circle one
INDEPENDENT DIRECT INVERSE SQUARED/POWER SQUARE ROOT INVERSE SQUARED

3) Looking at your $F_{A.R.}$ vs. v graph, what is the velocity for 9 filters?_____ Put a triangle at this point on the graph.

4) What is the slope of your F_g vs m graph? Please show all work <u>INCLUDING UNITS</u>.

slope

units

5) Draw the free body diagrams of the filter at the following positions, and circle "balanced or unbalanced."

the moment it is released	after reaching terminal velocity
●	●
BALANCED or UNBALANCED	BALANCED or UNBALANCED

6) Explain why objects don't reach their terminal velocity at the moment you release them.

7) Can an object reach terminal velocity on a planet that has no atmosphere? Circle and explain.

YES or NO

8) At one point between releasing and reaching terminal velocity, the 10 filters had an air resistance force that was half of what it was upon reaching terminal velocity. Determine the acceleration at this point. Draw the F.B.D. and start with the following equation.

$\Sigma F = ma$

●

a =

9) At one point between releasing and reaching terminal velocity, the 10 filters had an acceleration of 5.6 m/s^2. Determine the force of air resistance at this point. Draw the F.B.D. and start with the following equation.

$\Sigma F = ma$

●

$F_{A.R.}$=

10) This is the actual equation for air resistance $F_{drag} = \frac{1}{2} C \rho A v^2$ where C is a drag coefficient (determined experimentally), ρ is the density of the air, A is the effective cross-sectional area, and v is the velocity.

i) when a sky diver throws their parachute, what variable changes in the equation? C ρ A v

ii) golf balls fly farther in Denver than in New Orleans, this has to do with which variable? C ρ A v

iii) if you triple you velocity, you air resistance force will change by? 3 6 9 1/3 2/3 1/9