The Great Pumpkin Balloon Race

Team members _____ Balloon Number_____

_____

_____

_____

What is the upward (buoyant) force of your balloon? (12 points)

Mass of wood block _____

Mass of block plus balloon _____

Mass difference _____

What mass of cardstock would exactly balance the F_b? _____ (6 points)

Give your balloon back to the teacher now.

Challenge: create a "weight" out of cardstock that will exactly balance the buoyant force of your balloon. When your weight is ready, the teacher will attach it to your balloon and your balloon's performance will be rated.

(Complete the rest of this paper while you wait to compete).

What is the vocabulary word that means "all forces are balanced"? (6 points)

Convert the "buoyant force" in grams to Force in Newtons (10 points)

(g) (kg/g) (m/s^2) = _____

Analysis: (20 points)

a. Draw a Free Body Diagram (FBD) of a balloon floating at rest in mid-air.
b. Draw a FBD of a balloon accelerating toward the floor.
c. Draw a FBD of a balloon accelerating sideways, with wind and air resistance.
d. Draw a FBD of a balloon rising toward the ceiling at **constant velocity**.

a) b) c) d)

Write Newton's First Law in your own words (6 points).

How does the balloon-weight system demonstrate Newton's First Law? (6 points)

Write Newton's Second Law in words or symbols (6 points)

How does the balloon-weight system demonstrate Newton's Second Law? (6 points)

Write Newton's Third Law in words or symbols (6 points)

How does the balloon-weight system demonstrate Newton's Third Law? (6 points)

Performance: (10 points)
Scoring:
Balloon floats at one level (plus or minus 25 cm) for 30 seconds:

10 points plus 5-point bonus

Otherwise, time to rise from floor to ceiling or to sink from ceiling to floor will be recorded. Score will range from 1 to 10, depending on the results of the other teams.

1 2 3 4 5 6 7 8 9 10