Name _____ Period ____

Dunkin' for Density!

Important Definitions, Formulas & UNITS:

MASS: VOLUME: DENSITY:

Objectives:

• determine the density at which an object will **float, suspend or sink in water**.

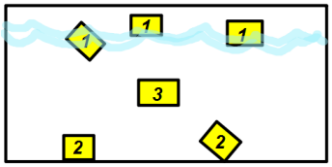
• Reflect on the relationship between mass, volume, and density **and relate it to balanced and unbalanced forces.**

Materials:

- Digital Scale
- 4 empty canisters per group (1 per 2 students)
- Small plastic tub filled with water (or a large beaker)
- Pennies, paper clips, pebbles, and marbles
- Graduated cylinder (for _____ of the sinking film canister)

Procedure Part 1:

1. Using the materials at your desk, modify three film canisters so that they will float, sink, or remain suspended (flink) in the middle of a tub of tap water. Your goal is to use as **FEW OF PENNIES or other MATERIALS AS POSSIBLE** in this challenge!
2. One canister should **FLOAT** (1)
3. Another should remain **SINK** (2)
4. And another should **remain in the middle (FLINK or NEUTRAL)** (3)
5. The race is to beat the other team to the FLINK. Each pair has one canister to try.



Procedure Part 2:

1. Once you have completed Part 1, use the equipment provided to find the mass and volume of each canister.
2. Record the information in **Table 1**.
3. Calculate the density for each canister using the correct density formula.

Data:

Film Canister	Mass (g)	Volume (cm^3)	Density (g/cm^3)
EMPTY CANISTER			
FLOATING			
NEUTRAL (FLINK)			
SINKING			
TAP WATER			

Based on your experiment, which canister was the most difficult to create? Explain your reasoning.

_____

_____

_____

Analysis and Results:

Based on each item's properties listed below, identify the location of each item if placed in a tub of tap water. For each item, write ***float***, ***sink***, *or* ***flink*** *in the blank space provided.*

A. 12 cm^3 and 10 g _____

B. 2.3 g and 3.6 ml _____

C. 0.99 g and .91 cm^3_____

D. 1.0 ml and 0.1 g _____

E. 4.5 g and 5.4 cm^3_____

F. 1.9 cm^3 and 7.5 g/cm^3_____

1. What is the mass of an **empty** canister? _____
2. Did the **mass** of the canister change at all throughout the experiment? Explain.
   _____
   _____
3. What is the volume of an empty film canister? _____ How did you measure it? _____
   _____
4. Did the **volume** of the film canister change at all throughout the experiment? Explain.
   _____
   _____
5. If you increased just the **mass** of an object, would it make the density of the object get HIGHER or LOWER?
6. If you increased just the **volume** of an object, would it make the density of the object get HIGHER or LOWER?
7. What caused each canister to stay at their level in the water? Explain what caused the canisters to float, sink, or suspend using the term **density**.
   _____
   _____
   _____
   _____
8. Why do you think it's possible to float (easier) in the Great Salt Lake and sink in Horsetooth Resevoir?
   _____
   _____
   _____
   _____
9. A hot air balloon basically floats in the sea of air. How can you explain this based on what you learned today? In your answer please use the words: **mass, volume, density, heat, and float.**
   _____
   _____
   _____
   _____
10. How do you suppose a submarine is able to change its buoyancy when it is moving through the deep ocean? Remember, most submarines prefer to remain undetected. Explain your ideas below. _____
    _____
    _____
    _____