Title: Chocolate Bar Density Lab

Target:

Students will discover that the density of an object is the ratio of an object's mass to its volume. They will practice calculating this physical property by determining the density of two candy bars, snickers and 3 musketeers.

The masses will be found on a digital scale. The volumes will be calculated from the length, width and height of each and determined by submerging in water, the displacement method. Don't forget when reading the graduated cylinder to read the bottom of the meniscus as shown below.

Pre-lab questions: (Do NOT include these in your lab report!)

1. Which is more dense, a marshmallow or hot chocolate? How do you know?
2. Which is more dense, water or oil?
3. What mass does 3.0 mL of gold have? (hint if you look up the density of gold you can solve for the mass.)

Materials:

Snickers	Digital Balance	Plastic Knife
Three Musketeers	100 mL graduated	500 ml beaker
cm Ruler	cylinder	

Procedure:

1. Unwrap the candy bars & record the mass written on the wrapper
2. Measure the mass using the balance of each and record.
3. How accurate are the masses on the wrapper?
4. Measures the length, width, height of each bar, don't forget sig figs!
5. Calculate the volume **v = l x w x h. (**don't forget sig figs)
6. Using the displacement method put some water in the graduated cylinder. Read the volume. Submerge the candy bar in the graduated cylinder. Read the volume. Subtract the ending volume from the beginning volume to get the volume of the candy bar. Repeat for the other bar.
7. Calculate density of each bar D= m/v D=density m=mass v=volume using the measure volumes from #5 (don't forget sig figs)
8. Recalculate the density using the submerged volumes from #6.
9. Knowing the density of water 1g/cm^3 which candy bar is more dense than water
10. Predict if each candy bar will sink or float in water
11. Drop into water and see if your predictions are correct
12. Cut the candy bars and draw what you see (a cross section of your candy bars.
13. What causes density difference.

Data:

	Snickers	3 Musketeers
Mass (wrapper)		
Mass (scale)		
Length (cm)		
Width (cm)		
Height (cm)		
Volume (lxwxh) (cm^3)		
Volume (submerged) (mL)		
Density D = m(scale)/v(lxwxh)		
Density D=m(scale)/v(submerged)		

The masses of the scale compared to the wrapper _____
I predict that the snickers will _____
I predict that the 3 musketeers will _____
My predictions were

Drawings:
Cross-section of snickers Cross-section of 3 musketeers

What causes the difference in densities?

Questions:

1. What is density?
2. If oil has a density of .88 g/cm^3, would it float on the liquid used in this lab?
3. Since a balance is much more accurate than a graduated cylinder, densities are found differently when an accurate answer is needed. A cylinder full of water is put on the balance and then the object is put in, allowing some of the liquid to spill out. Then the cylinder, object, and water (minus the spill-over) are weighed. The volume of the object is then calculated accurately. Use the following data to find the density of the unknown. Assume that the density of water is 1.000 g/cm^3.

Mass of cylinder full of water _____
Mass of object _____
Mass of object, cylinder and water (minus spill-over) _____
Density of object (watch your sig figs and show your work) _____

Conclusion: