

CALCULATING DENSITY

Introduction

Density is a physical property of matter. Each element and compound has a unique density associated with it. Density is the weight of something as compared to its size. This relative "heaviness" may be calculated using the formula of $\text{Density} = \text{mass (g)} / \text{volume (ml)}$.

$$D = m / V$$

Pre-lab questions

1. What is density?
2. Why don't oil and water mix?
3. Why does oil always rise in water?
4. From the following list of elements and compounds choose which you think is the most dense and which is the least: aluminum, iron, copper, water, oil, and glycerin.

Objective:

You will measure the density of aluminum, iron, copper, water, glycerin and vegetable oil

Hypothesis

Explain what you might expect each of the densities to be and why.

Materials

- Graduated cylinder (50 ml)
- Scale
- Vegetable oil (corn D= 0.922 g/ml or olive D= 0.918 g/ml)
- Glycerin (D= 1.26 g/ml)
- Distilled Water (D= 1 g/ml)
- 3 beakers (10 ml)
- 3 pipettes
- 1-3 g samples of the following metals:
 - o Aluminum sample (foil may be used) (D= 2.70 g/ml)
 - o Copper sample (wire may be used) (D= 8.96 g/ml)
 - o Iron sample (a nail may be used) (D= 7.87 g/ml)
- Work sheet to record values

Procedure

1. Weigh each metal sample separately and record each weight.
2. Add 20 ml of water to the graduated cylinder
3. Place the sample of iron inside the graduated cylinder
4. Carefully observe the value change in the cylinder
5. Record the difference in ml, i.e.: if it increased from 20 ml to 22.5 ml when you introduce the iron sample, record 2.5 ml in the data table.

6. Remove the iron sample.
7. Repeat step 1-6 with the aluminum sample.
8. Repeat steps 1-6 with the copper sample.
9. Label each beaker with numbers 1 through 3.
10. Weigh each empty beaker and record this weight in the data table.
11. Add 10 ml of water to beaker number 1.
12. Weigh beaker number 1 with water and record its value.
13. Add 10 ml of glycerin to beaker number 2.
14. Weigh beaker number 2 with glycerin and record its value.
15. Add 10 ml of corn oil to beaker number 3.
16. Weigh beaker number 3 with oil and record its value.
17. Calculate each density value using the formula: $D = \text{mass (g)} / \text{volume (ml)}$
18. Compare your values with those found in the literature.

Data Table

Density for metals				
Sample	Mass (g)	Volume difference (ml)	Density lab value $D=m/V$	Real Density value
Iron				
Aluminum				
Cooper				

Sample	Mass (g)
Empty beaker 1	
Beaker 1 with water	
Water net value	
Empty beaker 2	
Beaker 2 with glycerin	
Glycerin net value	
Empty beaker 3	
Beaker 3 with vegetable oil	
Vegetable oil net value	

Density for liquids				
Sample	Net Mass (g)	Volume (ml)	Density lab value $D=m/V$	Real Density value
Water				
Glycerin				
Vegetable oil				

Data Analysis and conclusions

1. Did the lab values correspond to the real or reported values? Why?
2. Did your hypothesis correspond to the results? Explain
3. According to density concept, why is it easier to float in the sea than in a swimming pool?