

# Experiment 1

## Determination of Density

# Purpose and Goals

- Learn the use of analytical balances
- Learn how to measure volumes
- Learn how to use significant figures

# Extensive vs. Intensive properties

- Extensive properties depend on the size of the sample.
- Intensive properties characterize a substance but are independent of the amount of material.

# Density

- Mass per unit volume of a substance
  - Mass/ Volume
  - (g/cm<sup>3</sup>) or (g/mL)
- Example of an intensive property
- Determined for six unknown samples

# Procedure

- Obtain 2 unknown samples of the same type
- Determine the mass of a 50-mL beaker on the analytical balance
- Determine the mass of the samples
- Determine the volume of each sample

# Procedure cont.

- Repeat the mass and volume determinations on two new Pair of samples

# Calculations

- Mass of samples
- Volume
- Density
- Average Density
- Percent Error
- Molar Volume

Mass of sample =

Mass of sample & Cont. - Mass of Cont.

=42.3449g - 28.4401g

=13.9048g (small)



Volume of sample

=Final volume - Initial volume

= $V_F - V_I$

=55.2mL - 50.5mL

=4.7mL

# Density

$$= \frac{\text{Mass}}{\text{Volume}}$$

$$= \frac{13.9048\text{g}}{4.7\text{mL}} = 3.0 \text{ g/mL}$$

# Average density

$$= \frac{\text{Sum of calculated densities}}{\text{Number of density values}}$$

$$= \frac{17.4 \text{ g/mL}}{6} = 2.9 \text{ g/mL}$$

Percent error

$$= \frac{\text{Observed value} - \text{Accepted value}}{\text{Accepted value}} \times 100\%$$

$$= \frac{2.9 \text{ g/mL} - 2.70 \text{ g/mL}}{2.70 \text{ g/mL}} \times 100\%$$

$$= 7.4\%$$

Molar volume of unknown

$$= \frac{\text{Gram atomic weight (Al)}}{\text{Avg. density}}$$

$$= \frac{26.98154 \text{ g/mole}}{2.9 \text{ g/mL}} = 9.3 \text{ mL/mole of Al}$$

# First lab report guide

- All lab reports and data sheets must be done in ink and follow this basic outline
  - I. Title page
  - II. Procedure
  - III. Data Sheets
  - IV. Sample Calculations
  - V. Graphs or tables (if needed)
  - VI. Conclusions

# Title page

- Title of experiment
- Date of experiment
- Your name
- Desk Number
- Names of GTAs

# Procedure Page

- **Briefly** describe what is done in the experiment
- Should not be the procedure as it appears in the lab manual



# Data Sheets

- From the lab manual
- Must be done in ink
- Must be signed by GTA

# Sample calculation

- One complete calculation of each type of calculations done in the experiment
  - Show formula, insertion of values and answer

# Graphs & Tables

- Full Page
- By hand or with excel

# Conclusions & Reflections

- What you learned
- Problems associated with the lab
- Thoughts on the lab
- Answer questions related to the lab