# Matter and Minerals
# Fall 2005

# Chemistry Lab
# Week 2

**We will meet in Lab II, 1234 on Thursday of Week 2, from 9 a.m. – 12 noon**

**Prepared and Presented by**
**Dr. Dharshi Bopegedera**

# Pre-Lab Assignment

## (To be completed prior to attending lab)

This work will be collected at the beginning of the lab. You will not be permitted into the lab unless this is submitted.

1. Define the following terms using your own words (you can read the chemistry text, but use your own words).

   - Chemical property (give 2 examples)
   - Physical property (give 2 examples)

2. Define the term “density”.

3. Volumes of solids are often determined by displacement. For this purpose you must first find a liquid in which the solid of interest in not soluble. Then add a specific volume of the liquid to a graduated cylinder (or other graduated device). Add the solid to the liquid in the cylinder. Measure the combined volume of the liquid and the submerged solid. The difference between these two volumes is the volume of the solid. It is important that the liquid you select have a density lower than that of the solid so that the solid will not float on the liquid.

   A metal block has a mass of 12.5 g. When placed in a graduated cylinder containing 32.5 ml of water, the volume of the block and water was found to be 54.2 ml. Calculate the density of the metal block. Show all work.

## Lab Activities (To be done in class)

Work in pairs. Completed lab notebooks are due on Tuesday at 8 a.m. in Lab I, 2006 (Dharshi Bopegedera's office)

### Part I: Exploring physical and chemical properties

Carryout the following experiments and record your observations in a table similar to the one given below. Determine whether your observations warrant a physical property or a chemical property.

| Experiment | **Observations** | **Physical/chemical property** |
|---|---|---|
| **Do this in the hood.** Clean a piece (about 2 inches long) of magnesium ribbon. Using forceps to hold the ribbon, hold it to the flame of a Bunsen burner. | | |
| Leave a piece of ice on a dish for 10 minutes | | |
| Pour out approximately 25 ml of vinegar into a 250 ml beaker. Add one tablespoon of baking soda to the beaker. Clean up all glassware when you are done. | | |
| Take a piece of aluminum foil (2"x 2" will be enough). Place it in a tray filled with water. | | |
| Observe the test tube filled with solid iodine in the hood | | |

**PART 2: Density Measurements**

You are provided with four unknown samples. Two of them are liquids (unknown samples) and two are solids (a quartz crystal and silicon dioxide). Your task is to determine the density of these samples. Then use this density data to identify the unknown liquids. You will need to refer to a standard table that gives you the densities of pure substances (use your chemistry textbook or the CRC Hand Book of Chemistry and Physics). Be sure to cite the references used.

- When determining the mass of substances, use the analytical balance.
- When determining the volume of solids use the displacement method. **First weigh the dry solid sample**. Add a known volume of an appropriate liquid to a graduated cylinder. Then add the weighed solid. The solid must be completely submerged in the liquid. Read the displacement of the liquid.

- When determining the volume of liquids, use a **burette** to obtain the required volume. A burette will be set up in the lab for each unknown liquid. Take a **covered** (cover with an aluminum foil)**, pre-weighed beaker** to the burette. Dispense about 5 ml (record the exact volume of liquid you dispensed) of the unknown liquid into the weighed beaker and cover with the foil. Now weigh the covered beaker again and determine the mass of the liquid.

- Measure and record room temperature. You will need this for density information.

- Report your data in tabulated form (example shown below) in your lab notebook. **Be sure to include the correct units.** The following table will work well for solid samples. Construct a similar one for liquid samples. Show all work in your lab notebook.

| **Substance** | **quartz crystal** | **silicon dioxide** |
|---|---|---|
| Room temperature | | |
| Mass of the unknown | | |
| Liquid used for displacement | | |
| Volume of liquid | | |
| Volume of liquid + unknown | | |
| Volume of solid | | |
| Density of solid | | |

- Compare the density of the quartz crystal with that of silicon dioxide. The chemical compound in quartz is silicon dioxide. If the two density values you calculated above are different, then give reasons as to why these values differ.

**PART 3: Density of copper**

Obtain a sample of copper. Weigh it with an analytical balance, determine the volume using the displacement method and determine the density of copper.

The recorded density for copper is 8.92 g/cm$^3$. Determine the percentage error of your calculated density using the following formula.

$$\text{percentage error} = \frac{\text{experiment al value - actual value}}{\text{actual value}} \times 100\%$$

If your percentage error is greater than 20% repeat the experiment.