Introduction to Natural Science (2006/07)

Fall 2006 Quarter

Chemistry Lab II
"Getting to Know the Elements & Volumetric Glassware"

Prepared by: Dr. Dharshi Bopegedera

Pre-Lab Assignment: Find an article on "why do leaves change color in the fall?" You can use books, journals or the web. Print out or copy the article and provide the proper citation for it. Read the article and use your own words to explain why leaves change color in the fall. Mike Paros has found an article relating to this topic on Science News for Kids. You may look for this article or any other. This will be collected in lab.

Part I - Preparing solutions using volumetric glassware

Do this part on your own.

1. You are provided with a **green colored stock solution**. Bring about 30 mL of this stock solution to your table in a clean, labeled beaker. Using a clean 10 mL pipette, pipette out 10.00 ml of the green colored stock solution into the clean 250 mL volumetric flask. Following instructions given in lab make a solution up to the mark of the volumetric flask with distilled water. Label this as solution A.

2. Clean a cuvette using distilled water. Use a Pasture pipette to transfer some of solution A into a cuvette and rinse the cuvette. Following instructions given in class determine the absorbance of solution A at 630 nm. The concentration of this solution is 0.2%.

3. Using a clean 10 mL pipette and a 5 mL pipette, pipette out 15.00 ml of the green colored stock solution into the clean 250 mL volumetric flask. Following instructions given in lab make a solution up to the mark of the volumetric flask with distilled water. Label this as solution B.

4. Clean a cuvette using distilled water. Use a Pasture pipette to transfer some of the solution B into a cuvette and rinse the cuvette. Following instructions given in class determine the absorbance of solution B at 630 nm. The concentration of this solution is 0.3%.

5. Use the following data to plot a "calibration curve" of absorbencies versus concentrations (think carefully about the dependent and independent variables). This can be done using the Microsoft Excel program in the CAL (CAL East is open for your use till 11 a.m.) Once the data is plotted, draw a "line of best fit" through the points. Then, plot your data point (for solutions A and B) on this graph. See if your data points are within acceptable range. If not, repeat the process until it is. When you are done, you can discard the solutions you prepared down the drain.

   Data for the calibration curve: Absorbance recorded at 630 nm

Concentration (%)	Absorbance
0.5	0.8371
0.1	0.1630
0.05	0.0862

Part II – Getting to know the elements

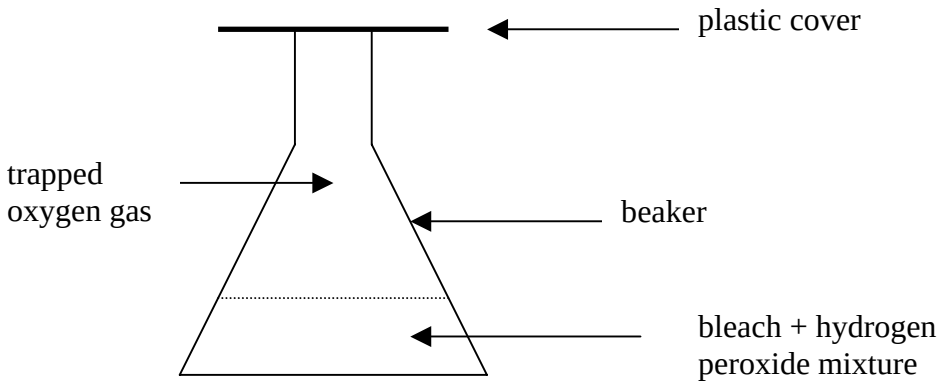
Work in pairs.

Experiment 1- making oxygen and testing its properties:

Oxygen gas can be prepared by mixing bleach and hydrogen peroxide. Since oxygen supports burning, one must take care not to make too much of it and not to have any flames around.

1. **Do this experiment in the hood.** Make sure no flames are near by. Add about tablespoon of household bleach to a small beaker.

2. Quickly add about 1 tablespoon of household hydrogen peroxide to the beaker and place a plastic cover over the mouth of the beaker. The liquid mixture will fizz for a while. This fizzing is due to the production of oxygen gas by the reaction between bleach and hydrogen peroxide. We cover the beaker to "trap" the oxygen gas inside the beaker. **Never cap the beaker containing the mixture of hydrogen peroxide and bleach. Instead, lightly cover it with a piece of cardboard or a plastic cover. If you cap the beaker, it will explode due to the build up of pressure of oxygen gas.**



3. Light a match and then blow it out. Remover the cover of the beaker and gently lower the burnt end of the match into the beaker. Observe if the match would re-ignite. What conclusions can you draw from your observations?

Experiment 2- testing the properties of nitrogen gas:

Obtain some liquid nitrogen into a thermal cup. Note that the liquid is continuously evaporating at room temperature and forming nitrogen gas. The “white cloud” you observe is due to the formation of water droplets (water vapor in the atmosphere is condensing into water droplets around the mouth of the thermal cup since liquid nitrogen is very cold).

Light a match and hold it to the mouth of the cup so that it is in the environment of nitrogen gas that is evolving from the cup. Write your observations and inferences based on this observation.

Experiment 3- burning sulfur:

Do this experiment in the hood. Obtain a small amount of sulfur. Hold it at the end of a spatula and burn it in the flame of a Bunsen burner. Slowly withdraw the burning sulfur from the flame and observe.

Experiment 3 – magnetism of metals:
Test the magnetism of the following metals: nickel, iron, cobalt, copper, magnesium, aluminum, calcium and lead. Write your observations.

Experiment 4 – Determining the melting point of gallium:
Place a small amount of gallium in a test tube. Put the tube into a small beaker of water. Record the temperature of water. Place the beaker on a hot plate and heat it very slowly. Carefully observe the gallium. When gallium starts to melt, record the temperature. When all of the metal has melted record the temperature. Determine the melting point of gallium from your data. Compare it with the data from standard tables (CRC Handbook is a good resource).

Experiment 5 – Synthesis of a compound from elements and separation of components from a mixture:

1. Weigh out 1 g of tin and 2 g of solid iodine using the analytical balance. Record the exact weights of these solids.

2. Place the iodine in 50 mL of demonized water (in a beaker) and add tin to the beaker. Place the beaker on a hot plate and slowly heat the contents. Do not allow the contents to boil and splatter.

3. Once most of the tin has reacted, remove the beaker from the hot plate and carefully filter the hot liquid, following instructions given in class. Do not discard the filter paper.

4. Carefully remove the filter paper and use the spatula to remove the left over tin from the filter paper. Let the tin dry on a watch glass and weigh the dry sample.

5. Allow the filtrate to cool. An orange solid should form as the liquid cools. This is tin(IV) iodide. Filter and let this orange solid dry in a desiccator. Accurately weigh the dry tin(IV) iodide.

6. Determine the grams and moles of tin that reacted.

7. Determine the moles of zinc that reacted.

Part III – What happens to leaves in the autumn season?

Do this part on your own.
I am sure you have noticed what is happening to leaves in the fall season. Let's do an experiment to see if we can understand the process further.

You are provided with a kale leaf extract (kale leaves are crushed and mixed with an alcohol to extract out the chemicals in the leaves. The extract is then reduced to a smaller volume by evaporation of the alcohol). You will be shown how to develop a thin layer chromatograph (TLC) of the kale leaf extract. Using the information provided in class, evaluate the components present in the kale extract.

Paste the TLC plate on your lab notebook. Also make a clearly labeled drawing of it on your book (the TLC plate will fade out soon). Deduce what happens to leaves in the spring, based on this experiment.

Is the kale leaf extract a pure substance, a homogenous mixture, or a heterogeneous mixture? Justify your answer. What kind of a technique is TLC? How is it different from filtration (you did in Part II, Expt. 5 above)?