

LABORATORY TECHNIQUE AND EQUIPMENT EXPERIMENT 1

OBJECTIVE

The objective of this experiment is to familiarize the student with the use of basic laboratory equipment and simple chemical laboratory techniques.

CHEMICALS AND EQUIPMENT

Fisher burner	Evaporating dish
Glass tubing	Crucible
Glass rods	Filter paper
Triangular file	Ring stand and clamp
Glass funnel	Triple beam balance
Test tubes (2)	0.15M $\text{Zn}(\text{NO}_3)_2$ - Zinc nitrate
Beaker (250 ml)	0.1M K_2CrO_4 - Potassium chromate
Flask (250 ml)	

DISCUSSION

Chemistry is an experimental science. To perform the experimental work, a sound foundation in experimental techniques and familiarization with the equipment is essential. The first experiment will help with the basic techniques and equipment that you will use throughout the rest of the course. Your success in future experiments will depend on the mastering of these operations.

Beakers

Beakers are cylindrical containers with wide mouths. Beakers are used when the entire area of the container must be easily accessible. Beakers are the "everyday" glassware of chemistry.

Erlenmeyer Flasks

Erlenmeyer flasks are conical cylinders in which the mouth is smaller than the bottom. Flasks are used for applications where "splattering" of materials must be avoided. Flasks are also commonly used for storage of liquids since the mouth is easily stoppered.

Graduated Cylinder

Graduated cylinders are tall cylindrical containers that are calibrated with marks (graduations) to indicate the volume of liquid contained. The graduated cylinder is used to accurately measure amounts of liquid.

Evaporating Dish

Evaporating dishes are white ceramic bowls with a wide opening on top and gradual sloped sides. They are used for evaporating liquids since they expose a large surface area to the atmosphere.

Crucible and Clay Triangle

The crucible is a conical vessel with rounded walls and a flat based used to incinerate or melt materials. The clay triangle is used to support the crucible over the burner. Tongs are used to handle hot crucibles.

Funnel

A funnel is a long tube with a large conical end. The funnel is used to pass liquids into small openings of containers. The funnel is also used in the process of filtering.

Wire Gauze

The wire gauze (6 x 6 inch square of metal screen with heat resistant pad imbedded) is used in conjunction with the ring stand. The wire gauze acts as a support when heating materials over a burner.

Fisher Burner (Bunsen)

A Fischer burner is a heating device that uses natural gas and air.

Test Tube

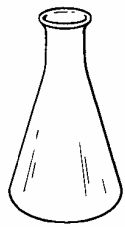
A long cylinder closed at one end and used to hold small specimens.

Spatula

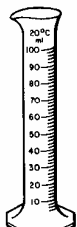
A spatula is a device similar to a spoon in which solids are transferred from one container to another.

Filtration

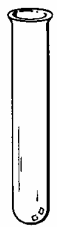
Filtration is a process by which one material is separated from another. This accomplished by a membrane with small porous openings. Smaller materials (filtrate) will pass through these pores while large particles (precipitates) will be stopped.



Erlenmeyer flask



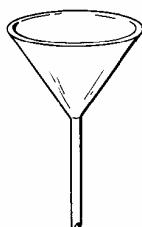
Graduated cylinder



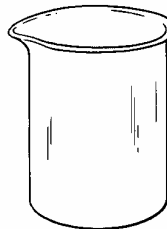
Test tube (soft glass)



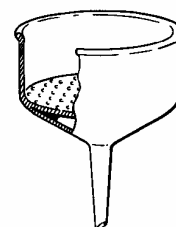
Test tube (pyrex)



Funnel



Beaker



Büchner funnel



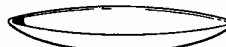
Thermometer



Porcelain crucible with lid



Mortar and pestle



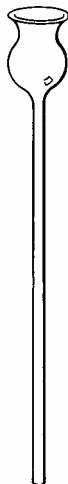
Watch glass



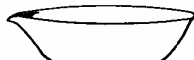
Porcelain spoon and spatula



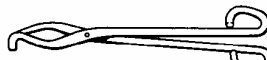
Test tube brush



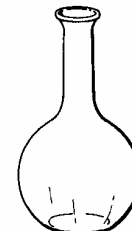
Thistle tube



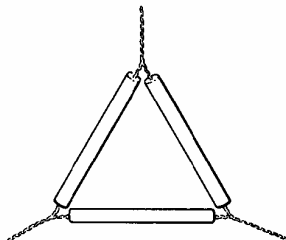
Evaporation dish



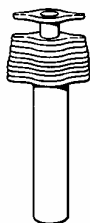
Crucible tongs



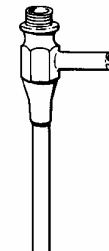
Florence flask



Clay triangle



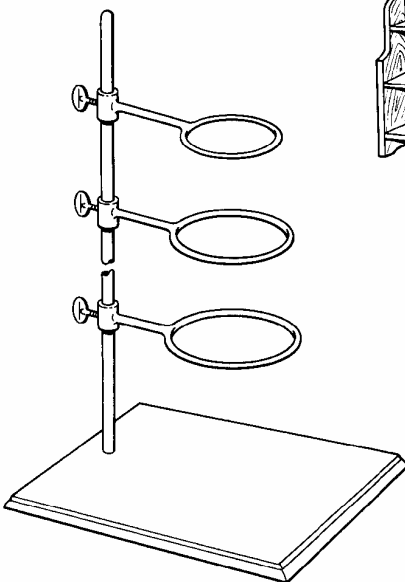
Cork borer



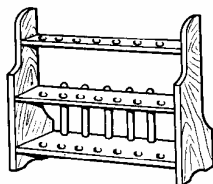
Water aspirator



Funnel support



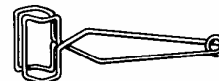
Ring stand with 3 rings



Test tube support



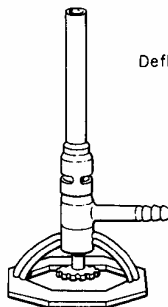
Deflagration spoon



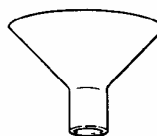
Test tube holder



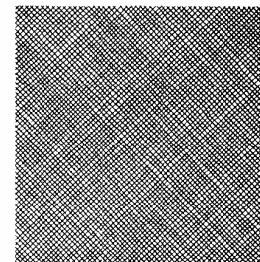
Filter flask



Tirrill burner



Wing top



Wire gauze

PROCEDURE

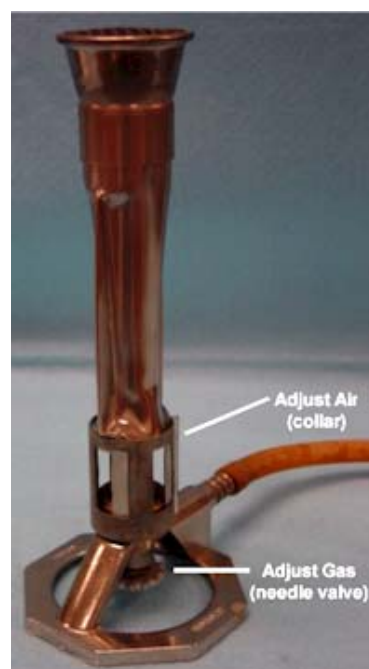
PART A - GLASSWARE AND EQUIPMENT

On your Report Sheet, make a simple drawing of each piece of equipment listed.

PART B - BUNSEN BURNER

In this part of the experiment, the use and operation of the Bunsen burner will be explained.

1. Connect the Bunsen burner (Fisher burner) to the gas outlet located on the laboratory bench. Make sure the gas valve on the bench is turned off.
2. Gently turn the bottom screw on the burner clockwise until resistance is felt. Do not over tighten. This valve controls the flow of gas to the burner. By turning it clockwise, you have turned it off.
3. Turn the air collar on the burner so that as much of the opening is closed as possible.
4. Turn on the gas outlet on the bench.
5. Turn the burner valve counterclockwise one turn and immediately ignite the burner head using a match, lighter, or striker. If the burner does not ignite, give the burner valve another turn. Repeat the procedure until it does light.
6. Open the valve (counterclockwise) until you get a flame approximately 4 inches high. As you can see, the valve regulates the amount of gas flowing through the burner.
7. The colour of the flame should at this point be yellow. A yellow coloured flame is called a cool flame. This type of flame is very inefficient. Not enough air (oxygen) is being supplied to completely burn all the gas.
8. To make a hotter flame (blue colour), open the air collar. By readjusting the air supply and gas supply, various flame temperatures can be reached.
9. Readjust the air collar to obtain a blue flame that gives off a crackling sound. This is a very hot flame.
10. To turn off the burner, always turn off the gas outlet at the bench.
11. When you are not using the burner, either turn it off (safest), or place it on the top shelf out of the way.

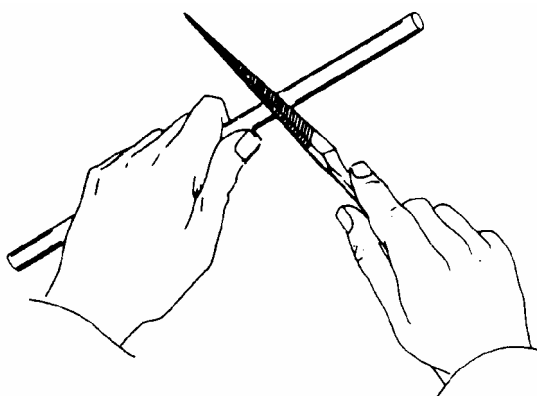


PART C - GLASSWORKING

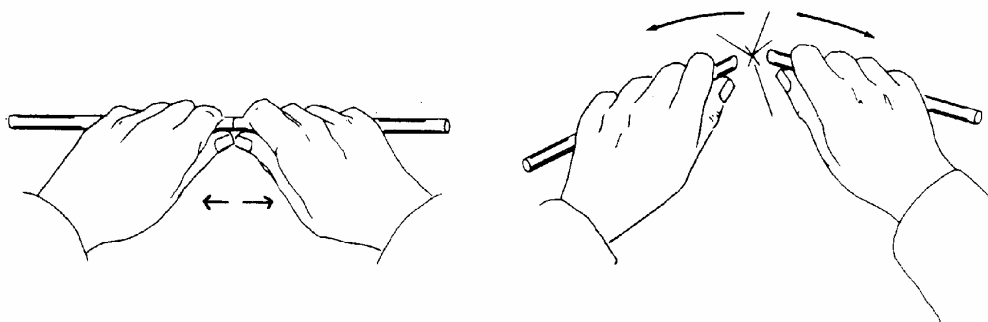
In this part you will cut and bend glass tubing, make pipettes, and fire polish the glass ends.

Cutting Glass Tubing

1. To cut a piece of glass tubing, obtain a triangular file and make one straight scratch on the glass tubing where you wish to cut it. Do not saw the glass. One smooth pull across the glass surface is all that is necessary.



2. Hold the glass rod with the scratch facing away from you. Place both thumbs about 1/2 to 1 inch on each side of the etched mark.
3. Pull on the tube as if you were going to stretch it. While pulling, bend it backward toward you very gently.
4. The glass should break with an even break. Be careful of the edges. They are sharp enough to cut. Cut two 20 cm pieces of tubing and two 20 cm of glass rod and two 30 cm pieces of glass tubing.
5. To avoid a future cut, the next step is to fire polish the ends (smooth and round).

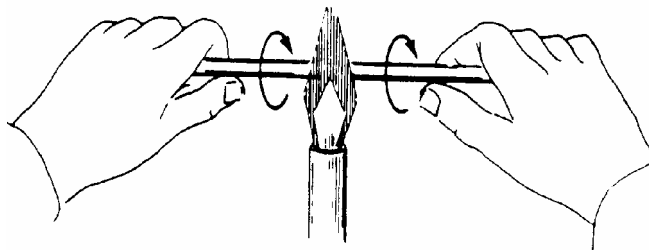


Fire Polishing

6. Light your burner and get a hot blue flame.
7. Place the end in the hottest part of the flame and rotate the tube. When heating the glass, do not look directly into the flame. The melting glass gives off a bright yellow sodium flame that can damage the eyes over a period of time.
8. Heat the end until the edges are smoothed over. Do not heat the tubing so much that the ends seal. Fire polish all the pieces which were cut.
9. Remember that the glass is hot after heating. Avoid touching the hot pieces.

Bending Glass Tubing

10. After the glass pieces are fire polished, the 30 cm piece of tubing is to be bent at a 90 angle .



11. Slowly heat the tubing in the burner at the 20 cm point. Keep the tubing perpendicular to the bench and slowly rotate it between your thumb and forefinger.
12. When the glass starts to bend downward, remove from the heat momentarily. Apply more heat (etc.) until the bend is 90 degrees.

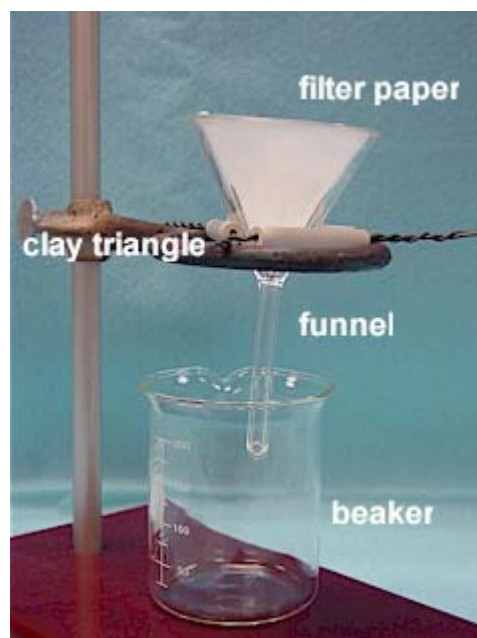
Making Pipettes

13. Next, a pipette dropper will be made. Heat the middle of the other 30 cm piece of glass tubing until the middle is very flexible.
14. Remove the tubing from the heat and rapidly pull the two ends apart. The glass tubing should stretch.
15. Allow the cool and break in half using a triangular file.

PART D - FILTERING SOLUTIONS

Solids and liquids can be separated by filtration. A porous filter is used which passes the liquid but retains the solids.

1. Fill a small test tube about 1/3 full with $\text{Zn}(\text{NO}_3)_2$ solution (zinc nitrate).
2. Fill a second small test tube about 1/3 full with K_2CrO_4 (potassium chromate) solution.
3. Pour the contents of the first test tube into a 250 ml beaker. Pour the contents of the second test tube into the same 250 ml beaker and stir.
4. A yellow milky solid should form. This solid is called a precipitate. Record your observation on the Report Sheet.
5. Take a piece of filter paper and fold it in half (1/2) and crease the fold slightly. Tear a piece of the corner off.
6. Fold it in half again. This gives you a quarter.
7. Open the quarter to form a cone. Fit the cone into a funnel with the torn edge next to the glass.
8. Wet with water and press the paper against the glass.
9. Set up the filtration apparatus.
10. Lay a glass-stirring rod across the top of the beaker so that it rests on the pour spout.
11. Pour the liquid and precipitate down the rod into the filter paper. Do not pour so much liquid that it goes over the top of the filter paper.
12. Allow it to drain until it has only about 1/4 the original amount of liquid in the filter.
13. Add the rest of contents of the baker to the filter paper.
14. Add additional DI water to the beaker, mix, and pour into the filter paper.
15. Repeat until all the precipitate is out of the beaker and into the filter paper.



16. What colour is the liquid in the bottom beaker? What is this called? What compounds are in the beaker? Refer to your Report Sheet.
17. What colour is the solid in the filter paper? What is this solid called? What compound is in the filter paper? Refer to your Report Sheet.

PART E - USING AN ELECTRONIC BALANCE

The laboratory instructor will demonstrate the technique of using an electronic balance, and unknown objects will be weighed.

1. Obtain three objects from your instructor and record the unknown number on the lab Report Sheet.
2. Weigh the objects and record the mass of each on the Report Sheet.
3. Weigh an object using some weighing paper but tare out (zero out) the weighing paper.



Name _____
Date _____
Section _____

**LABORATORY TECHNIQUE AND EQUIPMENT
REPORT SHEET
EXPERIMENT 1**

GLASSWARE AND EQUIPMENT

Make a simple drawing above the name of each piece of equipment listed.

BEAKER

FLASK

TEST TUBE

EVAPORATING DISH

CRUCIBLE

FUNNEL

BUNSEN BURNER

RING STAND

WIRE SCREEN

OPERATION OF THE BUNSEN BURNER

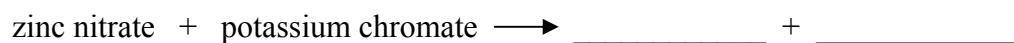
1. If the flame is yellowish, what type of flame is this?
2. If the flame is blue, what type of flame is this?
3. What do you do with the Bunsen burner when it is not in use?

GLASSWORKING

1. How does one cut a piece of glass tubing?
2. What is "fire polishing?"
3. SIGNATURE OF INSTRUCTOR FOR COMPLETED PIECES

FILTERING

1. What is in the first test tube?
2. What is in the second test tube?
3. When the two solutions are poured together:
 - a) What is a precipitate?
 - b) What is a filtrate?
4. Complete the following reaction (equation) using both symbols which represent elements and the names of the chemicals.



- a) What compound(s) are in the precipitate and state the colour.
- b) What compound(s) are in the supernatant and state the colour.

ELECTRONIC BALANCE

UNK _____ grams _____

UNK _____ grams _____

UNK _____ grams _____

Weight of tared out object _____ grams