Chemistry Lab #1: Glass Manipulation and Massing

FINAL DRAFT of lab (title through procedure) in lab book DUE FRIDAY, 9/16/11
LAB WILL BE ON FRIDAY, SEPTEMBER 16, 2011

Goal

The goal of this lab is to learn glass manipulation techniques and how to mass using a centigram balance.

Research Questions - answer the questions in complete sentences and try to relate them to the lab

1. What is a flame? What is the difference between a luminous and nonluminous flame? Where is the hottest part of a Bunsen burner's flame?
2. What is glass made of? What is its melting point?
3. Glass is not considered crystalline but amorphous. What do those two terms mean? Include an example of a crystalline substance.
4. What is glass used for (at least four uses)? Is all glass the same? Explain your answer.
5. What is an M.S.D.S.? What does it tell about a chemical?
6. What is glycerin (also called glycerol) used for? What is it made of? What are its hazards?
7. What is mass? What is weight? How are they similar? What are three differences between them?

Glass Manipulation

Many laboratory experiments require a variety of equipment setups. It is very common to have to use glass tubing of various lengths and shapes. You need to master some common types of glass manipulation.

Cutting glass can be a very simple process. Each person in your group needs to cut off a 20 cm piece. Lay the glass tubing on the desk. With a **single strong stroke** of the file (scratching toward yourself), make **ONE** deep scratch at the desired length. **Do not use the file as a saw!** After scratching the tube so that a definite scratch appears in the glass, pick up the tubing and hold it in the air with the **scratch facing away from you**.

CAUTION:

Put cloths or rags in both your hands while applying pressure to prevent injury to your hands in the event of the glass shattering.

Place both thumbs on either side of the scratch and, with a gentle push of the thumbs, press the tube away from you while at the same time firmly pulling the tube out as shown in Figure 1. If gentle pressure does not cause the glass to break at the point of the scratch, make a deeper score and

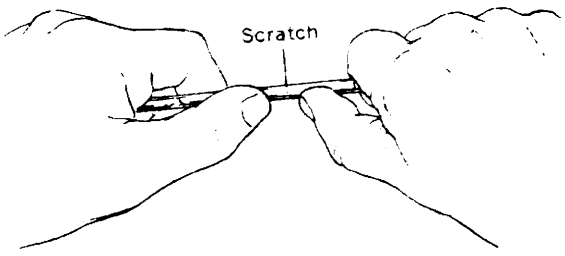

Figure 1: The Break
(but use rags over your hands!)

repeat. The break should be clean with no jagged edges. **Have your teacher OK the cut before continuing.**

Cut ends of tubing are sharp and can cause cuts and scratches. You should smooth these sharp edges by fire-polishing (also called glazing) the glass. Glass is not a true crystalline solid and therefore does not have a sharp melting point. In this respect it more nearly resembles an extremely viscous liquid and gradually softens when heated. It is this property which makes polishing glass possible.

The Bunsen burner, or some modification of it, is used for most laboratory heating. Although the details of construction vary among burners, each has a **gas inlet** located in the **base**, a vertical tube (**barrel**) in which the gas is mixed with air, and adjustable openings (**air ports**) in the base of the barrel. The air ports admit air to the gas stream. The burner may have an adjustable **needle valve** to regulate the flow of gas. In some models the gas flow is regulated simply by adjusting the gas valve on the supply line. The gas/air mixture is ignited at the top of the barrel (**mouth**) and burns with a smokeless, nonluminous flame that gives off intense heat.

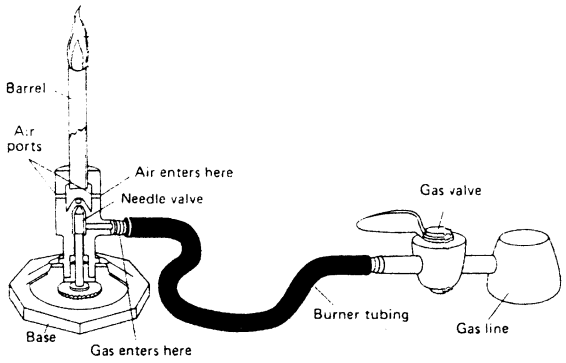

Figure 2: The Bunsen Burner

CAUTION:

It is important that the burner is always turned off at the gas jet, never at the needle valve. Whenever using a Bunsen burner, be sure to have a heat resistant pad at your desk. This is used to place hot objects on and to smother small fires.

To light the burner, partially close the air ports at the base of the barrel. Turn the gas jet on until you can hear the gas flow or until it is completely opened. If necessary, open the needle valve until you can hear the gas escaping. Hold the sparker just above the mouth of the burner and proceed to light the burner. The gas flow may then be regulated by adjusting the gas jet until the flame has the desired height, approximately 8 cm. **Each person in your group must light the burner himself/herself.**

CAUTION:

If an extremely low flame is needed, the air ports need to be partially closed as the gas pressure is reduced. Otherwise the flame may burn inside the base of the barrel. When improperly burning in this way, the barrel will get very hot, and the flame will produce carbon monoxide–a poisonous gas.

Once you have a flame that is burning safely and steadily, adjust the supply of air until you have a steady flame with a sharply defined, light blue inner cone. This adjustment gives the highest temperature flame possible with your burner. **Have your teacher approve the flame before you**

move on to the next part.

Hold the sharp edge of your cut piece of tubing **at a 45° angle** in the hottest portion of the flame and **rotate** the tubing until the edges soften and become rounded as shown in Figure 3. Place the tubing on a wire gauze to cool. After one end is polished and cool, polish the other end. Again, don't forget to **get your teacher's OK on the polished glass**.

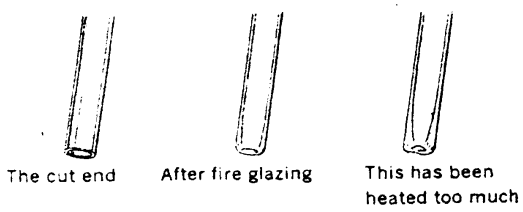

Figure 3: Good and Bad Fire-Polishing

At times it will be necessary to bend glass tubing. The flame needs to be spread using a wing top on the end of the Bunsen burner. Holding the tube at both ends (NO RAGS!!), roll the tube back and forth in the hottest part of a flat flame (parallel to the wing top) until it has become quite soft. **Remove it from the flame**, bend it quickly to the desired shape (for this lab, a 90° bend) and hold it until it hardens. **Place it on the wire gauze to cool**. **Get your teacher's OK. Be sure to trace your bend into your lab book once it cools**. See Figures 4 a-d.

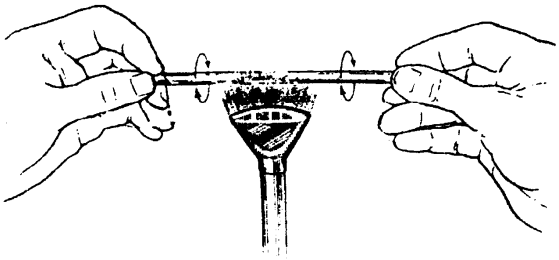

Figure 4a: Rotate until soft

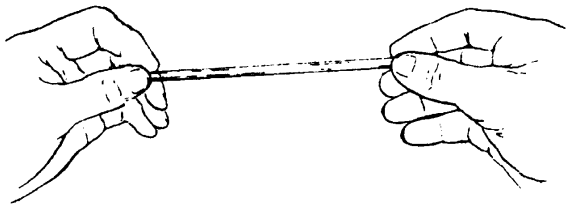

Figure 4b: Remove it from the flame

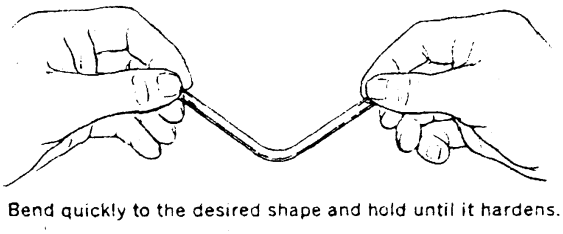

Figure 4c: Bend quickly

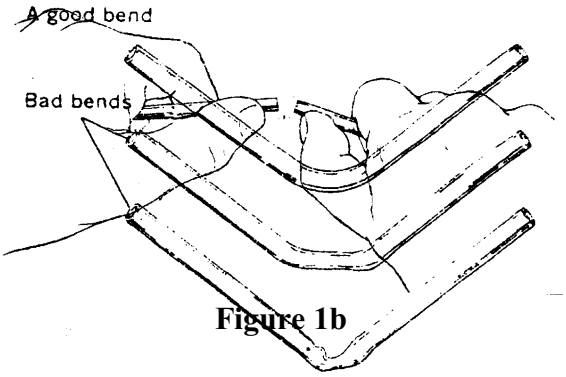

Figure 1b

Figure 4d: Good and bad bends

Next, insert the cooled, bent glass tubing into a #4 one-hole rubber stopper.

CAUTION:

Inserting glass tubing into rubber stoppers can be very dangerous. Make certain you protect your hands with a layer of cloth around the glass tubing before inserting it into the stopper. Always use glycerin to lubricate the end of the glass and the stopper. Never attempt to insert glass tubing that has a jagged end. All glass tubing should be fire-polished before inserting it into a stopper.

Add a drop or two of glycerin on the end of the tubing and in the hole of the stopper. Hold the glass with a cloth near the end to be inserted, and insert with a gentle twisting motion. See Figure 5. Once again, **get the teacher's OK**.

Figure 5: Twist!

Once you have inserted some glass into a stopper, trade it with your teacher for a glass tube that has been in a stopper for a long time. Your job is then to remove the glass from that stopper. It is the reverse of what you just did. The trick is getting the glycerin between the glass and the rubber. You need to use a microscoop. Run a line of glycerin around the hole on the top and bottom of the stopper. Holding the microscoop very near the hole, force the scoop down into the stopper. Repeat until you have circled the entire glass tubing (both top and bottom). While protecting your hands, you should be able to twist/rotate the stopper off the glass tubing. When you have removed the glass from the stopper, give both to your teacher.

Handling Solids

Throughout this year you will be working with a wide variety of solid chemicals. It is important to both protect YOU from the chemicals and to protect the CHEMICALS from you!

If you handle chemicals with dirty equipment, you may get very unexpected results! **Everything that will come into contact with the chemicals will need to be both PHYSICALLY AND CHEMICALLY CLEAN**. For this lab, you will need to clean a 30 mL beaker, a medium scoop, and a microscoop. Tap water and test tube brushes are used to physically clean equipment. Next, equipment is made chemically clean by rinsing it with distilled water (to remove the tap water residue). The equipment is then dried with the air jet (and/or paper towel). Finally, containers are labeled (with a permanent marker) with the name (or formula) of the chemical being used AND your initials. **NEVER, EVER WRITE ON THE WHITE OR BLUE SPOT!!!!**

It will often be necessary for you to get chemicals out of their original stockroom reagent bottles. It is important that you know how to do this **without contaminating the source**. **If contamination occurs, you will have to pay for an entire new bottle of the chemical**.

CAUTION:

Do not touch chemicals with your hands. Some chemical reagents readily pass through the skin barrier into the bloodstream and can cause serious health problems. Chemicals can also be extremely corrosive. Always wear your goggles and apron when handling chemicals. Carefully check the label on the reagent bottle or container before removing any of the contents. Never use more of the chemical than directed.

When removing the top of the reagent bottle, NEVER set it down on the counter. This means that you either have to hold the top in your hand OR place it (with the inside of the lid facing up) on a CLEAN paper towel. See Figure 6 for an example. Don't ever assume that a paper towel you find on the counter is clean!

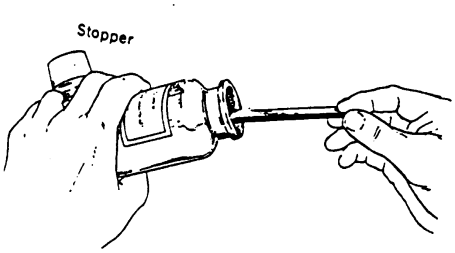

Figure 6: Obtaining a solid

Remove two scoops of sodium chloride (NaCl) from its reagent bottle using a CLEAN, DRY medium scoop. Place the solid in your CLEAN, DRY, LABELED 30 mL beaker. Be sure that your beaker is properly labeled [with the name of the chemical that the beaker will contain (NaCl) and your initials].

****Never return unused chemical back into the source container****

The Balance

Measuring mass is a very important skill for the accurate execution of any chemical experiment. At LHS, you will be using an unequal arm balance (See Figure 7) which is calibrated to 0.01 g (which is why it is called a centigram balance ☺). When this measuring tool is used properly, it is precise to ± 0.01 g. **All balance measurements should be recorded to 2 places after the decimal point**. NO MORE, NO LESS!!!

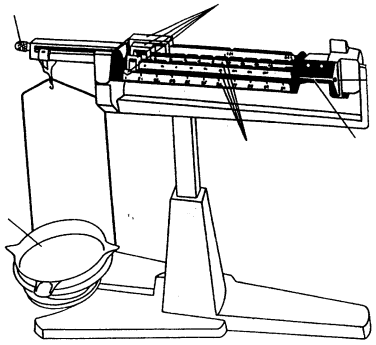

Figure 7: The Centigram Balance

Place a paper towel in front of the balance and place your materials (beaker, medium scoop, and microscoop) on it. Before using the balance, always check to see if the pointer is resting at zero. If the pointer is not at zero, check to see if the riders are at zero. If, after moving the riders to the left, the balance is still not zeroed, seek the help of your teacher. **NOTE**: The balance will not adjust to zero if the massing pan has been removed.

When massing chemicals, place the container (usually a massing cup) on the massing pan. **NEVER PLACE CHEMICALS DIRECTLY ON THE BALANCE'S PAN.**

The next thing to do is mass out 5.00 g of NaCl. Choose a balance and record the balance number. You will then need to mass an empty massing cup. Without removing the cup, **increase** the mass on the riders by 5.00 g (or, at a later date, by whatever amount you need to mass out). Pour the chemical into the massing cup until the pointer is almost at zero. Using a microscoop, slowly add more chemical until the pointer is once again pointing at zero. **Before you remove the solid from the balance, have your massing approved by the teacher**.

Massing data should always be recorded as follows:

Balance # _____

Mass of:	NaCl (or whatever chemical) + cup	=	_____ g
	cup alone	=	_____ g
	NaCl	=	_____ g

When finished massing, move the riders back to zero and carefully remove the massing cup. Clean off the massing pan and pan support onto a paper towel. **Dispose of the NaCl from the cup and the paper towel into the labeled waste container**. The empty massing cup may be thrown into the waste paper basket.

Clean Up

Use ethyl alcohol and a paper towel to remove the label from the beaker. Show your clean, de-labeled beaker to the teacher. Put away any other equipment on your lab desk. Show your clean lab desk to your teacher so she can give you a clean-up signature in your lab book. Have your lab partner sign (or initial) the end of the day's data; you should also sign (or initial) the data. Once all students have cleaned up and your teacher has indicated you may do so, wash your hands with soap and take off your goggles and apron.