Procedure! Procedure! Procedure!

Basic lab skills your students should know and practice

SAFE SCIENCE: BE PROTECTED

*By Dr. Ken Roy**

Let It Be Written, Let It Be Done!

The laboratory is a fun but serious place to work for learning about science. It is fun because of the excitement it tends to elicit from students working as scientists. It is serious because of the dangers that loom. In order for students to make safe use of the laboratory as a work place, specific activity protocols should be in place, written and reviewed by students with the instructor to make sure there is understanding and skill development. Follow-up reviews are also a good idea during the school year with students. From the start, students need to know:

- ➢No unauthorized experiments are allowed. The laboratory is too dangerous a place to have unskilled occupants doing their own thing.
- ➢No eating or drinking is allowed in the laboratory save some instructor allow the sports cap water type bottles.
- ➢No horseplay is to be allowed. A simple prank can cause serious injury or even death.

"In order for students to make safe use of the laboratory as a work place, specific activity protocols should be in place…"

There should be an established discipline procedure and equally important –enforcement.

Prudent practice and procedure is critical to laboratory safety. The following laboratory practices/procedures are a few examples of what needs to be shared with students before they begin to work in the laboratory.

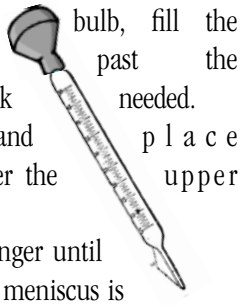
Suck It Up! – Not In This Case!

Pipetting operations are still used in many school science laboratories today. Unfortunately, students tend to want to mouth pipette. This is a very dangerous practice for some obvious and some not so obvious reasons. The use of pipette aids/fillers/pumps is an acknowledged safety practice to avoid mouth contact with chemicals and biological materials. However, if a glass pipette is being inserted into a pipette filler, the pipette may break resulting in laceration to the hands of the operator. Similarly, placing the rubber bulb onto a glass Pasteur pipette ready for use, can result in injuries to the hands if slippage occurs and the Pasteur pipette fractures.

One way to remove the potential glass accident is to use polycarbonate pipettes. Disposable polyethylene Pasteur pipettes can be used in place of glass Pasteur pipettes.

General Procedure:

A. Put on chemical splash goggles and aprons.



B. Using a pipette bulb, fill the pipette just past the graduation mark needed.

C. Remove the bulb and place the forefinger over the upper end of the pipette.

D. Release the forefinger until the bottom of the meniscus is on the desired graduation mark.

E. Touching the pipette tip to the inside wall of the receiving vessel, allows the liquid to drain.

F. Touch the pipette tip to the side of the receiving vessel until the flow stops.

Suck it in! – Not in this case!

In some experiments, odors need to be smelled. Never smell a flask directly. If it is absolutely necessary to test the odor, carefully waft the vapor from the flask toward the nose with a hand. Keep the flask as far away from the face as possible. Again, make sure chemical splash goggles are in place before working in the laboratory.

AAA – No – Not The Auto Club!

Personal protective equipment is necessary to protect students from harmful exposures in the laboratory. In most cases, latex or vinyl gloves are used. However, in dealing with serious chemicals such as acids, nitrile gloves should be used. Unfortunately, caution must be used in that nitrile gloves are heavy and slick when wet. It is wiser to let students use only diluted acids. In addition to gloves, chemical splash goggles, aprons, long pants and long shirt sleeves should be worn.

In diluting concentrated acids, never add water to the acid. It will quickly generate large volumes of heat causing splattering and potential shattering of the glass vessel. Always add concentrated acid to water or "AAA." Always keep the acid bottle at arms length in case there still is some splattering or spillage.

Turning up the heat!

Most school science laboratories use Bunsen burners as a heat source. The first safety concern is burner tubing. Too often thin latex tubing is used. This is dangerous in that over time, it dries out and cracks opening the door to a gas leak and explosion. A burner tubing connector made of galvanized and rust-resistant flexible metal tubing is approved by most gas association standards. It will provide a gas-tight way of connecting the burner to the source.

Make sure students firmly attach the hose to the gas outlet. Loose fittings can again leak gas and have the potential for an explosion or strike-back flame. With eye protection in place, the gas is turned on with a gentle flow (minimum open position). Light the burner by bringing a match slowly up the side of the burner toward the nozzle. Quench the match with water. Do not throw it into the waste directly to prevent fire.

An alternative is to use a flint lighter over the top of the burner. Do not place the hand over the top, only the end of the flint lighter. A

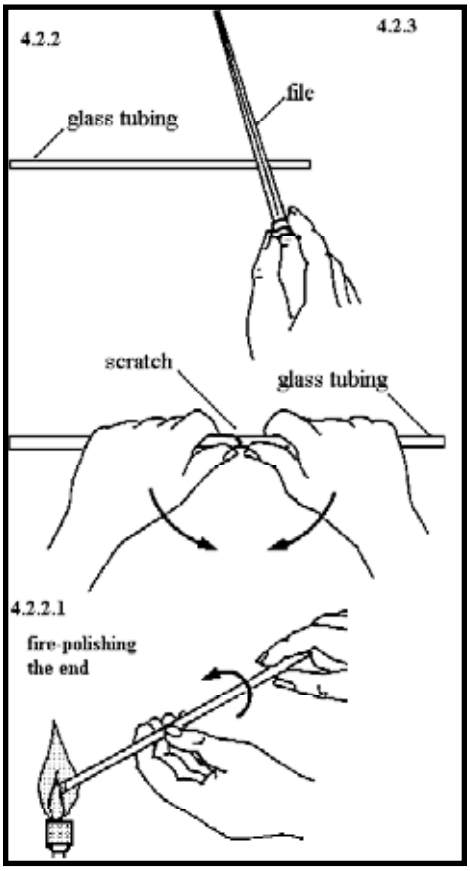
third option is the butane safety lighter.

Once the flame is established, adjust the burner for a proper flame: i.e., pale violet outer cone and pale blue inner cone.

Scoring with glass!

Certain laboratory work setups require glass tubing to be cut and polished. The following safety tips should be observed when working with glass:

- Be sure to wear correct eye protection – either safety glasses or goggles.
- Determine the length of tubing needed.
- Using a triangular file, score or scratch the glass tubing on the same spot carefully pulling the file in the same direction across the glass several times.
- Wrap a paper towel or cloth around the



glass tubing. Placing thumbs opposite the scratch, apply force with thumbs and snap the tubing away form the body using a quick motion.

- Polish the glass by rotating the end of the cut tubing until the edges are smooth and rounded. Do not over heat the end. This could seal the end and cause problems in the experiment.
- Be sure to throw any piece of glass in the proper container. Do not leave any laying around at work-stations or floors.

Final Safety Comment!

Remember to always wash hands with soap or detergent before leaving the laboratory. Also make sure no chemical residue is hitchhiking on clothing.

Resources:

Occupational Safety and Health Administration: http://www.osha.gov
American National Standards Institute: http://www.ansi.org
Canadian Organizations Government Standard Sites: http://www.safetysmartmagazine.com/page-bin/links'canadianorg.htm
European Agency for Safety and Health at Work: http://uk.osha.eu.int/about/list.stm
Glass cutting diagram: http://www.uq.edu.au/_School_Science_Lessons/

LIVE LONG AND PROSPER SAFELY!
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