Plasma Processing Laboratory

Basic Laboratory Safety Clearance

Preamble

Every new member of the Plasma Processing Laboratory (PPL) must be granted the *Basic Laboratory Safety Clearance* (BLSC) before being authorized to work alone in the laboratory. The BLSC guarantees that (you) have received the appropriate basic information and training pertaining to laboratory safety and use of common PPL equipment. Your direct supervisor - a professor or a graduate student of the PPL - is responsible for your training. In order to be granted the BLSC, you will have to demonstrate your knowledge of basic laboratory safety and practices to a member of the Departmental safety committee (Mr. Frank Caporuscio) and to your immediate supervisor. The BLSC does not constitute a substitute to the Departmental Safety Questionnaire & Demonstration that is aimed at qualifying you for the use of a specific laboratory setup. Rather, it constitutes a first step towards completing these important requirements. The comprehensive list of questions that are included in this document will help you prepare for the BLSC examination. Make sure you find answers to all questions with the help of your immediate supervisor and independent readings and searches.

Identification

Researcher name: _____

Education level: ☐Undergraduate, ☐Graduate, ☐Exchange, ☐PDF

Direct supervisor: _____

Approval

Date: _____ (year/month/day)

Departmental Safety Committee representative: _____/_____

Name Signature

A) Before Entering the Laboratory

1. A laboratory coat is required. Give at least two important reasons why a lab coat is required. Why is it important to wear a lab coat that fits your size (at least two reasons)? Why is cotton a preferred material for your lab coat?
2. Laboratory goggles are required. Give at least two important reasons why.
3. Why short pants and skirts are forbidden?
4. Why open-toe shoes are forbidden?
5. Why is loose long hair forbidden in the lab?
6. Why is it that food and beverages along with empty containers of such are forbidden in the lab?
7. The red light above the laser laboratory is flashing. What does that mean? Are you forbidden from entering the lab? If you enter the lab, what are the main safety considerations?
8. What are the normal PPL lab hours?
9. If you are going to work alone, what you should do before entering the lab?
10. Where are the closest shower and eyewash station?
11. Have you listed and read the MSDS of each chemical you will be using once in the lab?
12. If you are still an apprentice with gas cylinders and regulators, handling and storage of chemicals, handling of waste chemicals, and fume hoods, go through the information pages available on the departmental website: http://www.mcgill.ca/chemeng/chemeweb/safety

B) In the Laboratory

1. Put on a lab coat. Button up (all snaps) your lab coat and put on your glasses. Why snap-button lab coats are preferred over buttoned ones?
2. You need to quickly become aware of the ongoing activities (various occupants). Why?
3. If you enter the lab for the first time, perform a quick survey of your surroundings. Locate the fumehood(s), fire extinguisher (if available), the second exit, the phone, and the locations of the waste bins.
4. If you work alone in the lab, should you leave the main door open? Why?
5. Music player with earphones are forbidden. Why?
6. As you enter, you notice a noxious smell. What are the three important steps you should go through?
7. Who is the lab safety officer?
8. What do the black/yellow stripes on the floor mean?
9. Entering the lab you see a student who is not following safety protocols in handling liquid chemicals, or is eating in the lab, or is not wearing the required safety equipment. What should you do?
10. Entering the lab you see an unidentified person who is not an authorized student in the lab. What do you do?

C) Working in the Fumehood

1. While working in the fumehood, should you be wearing gloves? What type of gloves?
2. Does your lab have a chemical spill kit? Who should you call if there is a large spill?
3. Labeling your beakers is very important. Why?
4. Disposing of waste chemicals requires special training. Who is the person to talk to for proper training? How do you segregate chemicals in the waste bins? When and where can you dispose of/replace your waste bins?
5. How do you dispose of damaged glassware?
6. How do you safely dispose of inert solid waste?
7. When you need to transport chemicals, waste bins or gas cylinders, which elevator should you use?
8. The alarm on the fumehood suddenly goes on. What should you do?
9. Ventilation and/or power goes down while you run an experiment. What should you do? This answer depends, of course, on the equipment, chemicals and operating conditions of your experimental setup.

D) Leaving the Laboratory

1. Is it a better practice to leave your lab coat in the lab or to bring it to your office?
2. You may have used gloves in the lab. Why are they forbidden outside the lab? Where do you put them?
3. Should you wash your hands before leaving the laboratory?

E) Emergency

1. What is the phone number for McGill security?
2. An accident happens and somebody is hurt. Shall you call Security or 911 first?

Appendices

A) Before Entering the Lab

1. Lab coats are important as they act as a temporary barrier between the skin and any possible hazards like fire or corrosive chemicals. It also protects clothing from getting contaminated by any harmful chemicals or microorganisms that might be used in the lab. Improperly sized lab coats inhibit your motion and can cause accidents by getting caught on things in the lab or by knocking over small objects. Cotton breathes well and is comfortable to wear for long periods. **REMEMBER: never wash a lab coat and never leave home with one. It is also important not to eat or drink while wearing the lab coat.**
2. Lab goggles are important to prevent any chemicals from entering the eyes. Symptoms could range from irritation to permanent blindness. Goggles are also important to protect the eye from any small flying objects.
3. At all times the whole body must be covered to avoid direct contact of any chemical with the skin. Wearing shorts or skirts exposes human skin to potential hazards like corrosive chemical spills that could cause first degree burns.
4. Open toe shoes must not be worn (same reasoning as 3). Wearing closed shoes will reduce the intensity of injury in case of any heavy objects falling on the person's feet.
5. Hair longer than shoulder length should be tied back because (A) it is flammable, and if you are near an ignition source with long loose hair, it might catch fire; (B) it might fall into chemicals/media on the bench top and be a source of contamination, either for you or for the media; (C) long hair can interfere with your vision; and (D) it could get caught in rotating lab equipment such as bench top stirrers.
6. Food and beverages are considered contaminated once they enter any lab. It is important not to bring empty food containers in the lab. In this manner, food containers will not travel from the lab to the office and vice versa and be used after they've been exposed to the laboratory environment.
7. The red light flashing means that a laser apparatus is being used in the corresponding lab. Only authorized personnel (people working in that same lab) are allowed to enter the lab. Researchers working in the lab must not cross the laser setup caution lines. People using the laser setup must inform people already working in the lab that they will be using the laser as there is no flashing red light inside the lab.
8. The PPL lab operates from 8am to 5pm. It must be noted that intern and undergraduate students must not be working in the lab outside these hours of operation. This is done to ensure safety of interns and the labs. If for some reason, a student needs to work at night or during the weekend, please inform McGill security that you will be working in the lab so they can perform routine checkups.

9. Before working in the lab alone, the researcher should inform another person (or security who will carry out regular checks) that they will be working in the lab.
10. Eye wash stations and showers are located outside the lab. Please locate these visually before entering the lab. This is important precaution in case of an accidental chemical spill or splash.
11. Reading the MSDS of a chemical that is being used is extremely important. Users must be familiar with the hazards that the different chemicals present and how to deal with emergency situations. The MSDS gives the student an outline on how to deal with the chemicals and how to store them correctly. Storing chemicals in the wrong cabinets could lead to serious accidents.

B) In the Laboratory

1. Snap buttons are important because it makes it easier to remove lab coats in case of an accident.
2. Various lab activities can be dangerous to those in the area. By knowing what work is occurring in the lab when you enter, you can avoid unnecessary exposure. An example is laser radiation.
3. It is vital to know the avenue of escape in case of a serious accident or incident.
4. The main door should be open when working alone, with some exceptions, to allow for passers-by to see in. The risk of death in the lab is significantly less when an accident can be discovered. One exception is when working with a laser; then the lab doors should be closed.
5. Music players distract you from both the task you are performing and the activities surrounding you in the lab. In particular, noises that would alert you of an accident or other safety incident would go unnoticed.
6. If you hear a fume-hood alarm as you enter the lab: First, look for anyone in the lab. Second, get out of the lab and close the door. Finally, call the lab safety officer.
7. The lab safety officer is the graduate student who is assigned the task of overseeing the safety practices in the lab. He or she is responsible for safety as well as training of lab personnel.
8. The black and yellow striped tape is used to indicate a potentially hazardous installation in the lab. Unauthorized personnel should not enter the perimeter marked by the tape while a student is operating it.
9. When other students in the lab are not following safety regulations, it is your responsibility to maintain your own personal safety. Inform the lab safety officer and avoid working in areas where hazardous behaviour is taking place.
10. Unidentified people are seen in labs, for various reasons. For example, visiting professors are sometimes given tours of lab facilities. Unfortunately, it also happens that unaffiliated people will enter the labs looking for opportunities for theft. If you see a person who is not authorized to be in the lab, stand at the door and ask their name. If you get the feeling

that they are potentially dangerous, do not enter the lab, but rather go to the nearest phone and call McGill Security.

11. **Do not leave a potentially unstable or hazardous experiment running unsupervised. If you ask a colleague to temporarily monitor the experiment, it is your responsibility to inform him/her of the potential hazards and basic safety measures.**
12. **In case you need to leave the lab in an emergency situation, you must shut off the gas tank valves and turn off the power supplies. These must be easily accessible since time matters. Then, leave the lab.**
13. **You need to keep your working area along with any other shared space clean and uncluttered. This will minimize the risk of spills and object falls, and give you a direct access to critical equipment in case of an emergency situation.**
14. **Avoid having electrical wires or tubing on the floor. Ideally, they should be routed through overhead conduits or bins. If a wire or tubing must be kept on the floor, it must be covered and made highly visible through the use of black/yellow striped tape. Avoid such situation in high traffic areas.**

C) Working in the Fumehood

1. While working under the fumehood, always wear gloves. To choose the appropriate glove material consult Table 1. CAUTION: these gloves are good for incidental exposure to the chemical products. If you need to dip your hand in the product, find a non-disposable glove made of the appropriate material.
2. Before starting work with liquids, know where you can find a bucket of sand, cat litter or commercially available spill absorbents, in case you spill something. If you have a large spill, call 3000 immediately.
3. Always label beakers, vials or any container where you pour a liquid, EVEN IF IT'S JUST WATER! This helps you to keep your experiment organized and to better manage your waste at the end of the experiment.
4. Waste should be disposed of in an appropriate manner. The garbage bin is for garbage. It is not for needles, syringes, pipette tips and broken glass. Refer to Table 2 to determine where to put your waste. Ensure that the product you are putting in the bin is identified on the bin's label.
5. Do not fill waste bins beyond the ½ way level. When the bin is half-full, take it to the 3rd floor during the weekly-scheduled waste collection period. Remember that for transport of waste bins or chemicals, it is mandatory to use the service elevator (back elevator).
6. If you hear the alarm of the fumehood or the red LED is flashing, it indicates that the ventilation system is not working properly. Stop your experiments immediately and leave the lab.

Table 1. Required gloves for incidental exposure to chemical products

Chemical	Glove material	
	Good	Bad
Acetone	Neoprene, Natural Latex, Butyl	Nitrile Latex
Acetic Acid	Neoprene, Natural Latex, Butyl, Nitrile Latex	--
Chloroform	Neoprene	Natural Latex, Butyl, Nitrile Latex
Ethanol	Neoprene, Natural Latex, Butyl, Nitrile Latex	--
Ethylene Glycol	Neoprene, Natural Latex, Butyl, Nitrile Latex	--
Hydrochloric Acid	Neoprene, Natural Latex, Butyl, Nitrile Latex	--
Isopropyl Alcohol	Neoprene, Natural Latex, Butyl, Nitrile Latex	--
Methanol	Neoprene, Natural Latex, Butyl, Nitrile Latex	--
Sodium Hydroxide 50%	Neoprene, Natural Latex, Butyl, Nitrile Latex	--

Source: *Glove Selection Guideline*, Argonne National Laboratory, URL: http://www.aps.anl.gov/Safety_and_Training/User_Safety/gloveselection.html (consult website for a more extensive list of chemical products and more details on different types of gloves)

Table 2. Waste containers

Waste category	Waste bin	Where
Solid (exception of glass)	Any solid container with a lid	Call EHS
Glass	Special box for broken glass	Lab 5150
Acids	Yellow bins (don't mix with bases)	3rd floor by the service elevator on Thursdays between 10:30 and 11:00.
Bases	Yellow bins (don't mix with acids)	
Organics (non-halogenated solvents)	White bins (don't mix with halogenated solvents)	
Organics (halogenated solvents)	White bins (don't mix with non-halogenated solvents)	

Note: For urgent need of waste bins, please contact Frank Caporuscio or Andrew Golzstajn.

D) Leaving the Laboratory

1. It is better to keep your lab coat in the lab in order to avoid bringing any chemicals or other contaminants into your office.
2. The use of disposable gloves in the hallway, offices or elevators is prohibited. Again this is to avoid contamination of the space outside the labs. Outside the lab, people do not wear gloves and if a person contaminates a door handle for example, others will get contaminated as well.
3. It is good practice to wash your hands after you remove your gloves.

E) Emergency and Contacts

1. In case of an emergency, first call 911. Then call McGill Security: dial 3000 on any McGill phone.
2. Lab accidents happen and an accident report is required no matter how small the accident, incident or near miss may be!

F) Potential Hazards in the PPL - Be Aware (Your supervisor must inform you).

1. High voltages, high currents
2. Radio-frequencies (13.56 MHz)
3. Vacuum (low-pressure)
4. High-pressure gas tanks and lines
5. Cluttering
6. Lasers
7. Volatile organic chemicals
8. Potentially explosive chemicals
9. Nanomaterials
10. Pressurized water lines
11. Pump noise

Safety questions? Safety issues? Contact your supervisor; visit the Chemical Engineering safety web site at: http://www.mcgill.ca/chemeng/chemeweb/safety/, contact the Chemical Engineering safety committee and/or EHS at McGill University at http://www.mcgill.ca/ehs/