**Safety in the Chemistry Laboratory**

**Safety Orientation / WHMIS Online Course**

Before you can begin to work in a Chemistry Laboratory at the University of Waterloo, you must have completed the Student Safety Orientation / WHMIS at Waterloo online safety training course accessed via Waterloo LEARN. If you cannot show proof that you have completed this course you may be asked to leave the laboratory.

**Preventing Accidents / Injury**

* Give strict attention to all instructions and ask for clarification if you do not understand. Do not perform unauthorised experiments. Never leave an experiment unattended.
* Keep sinks and bench tops clean. Wipe up all spills and bottle rings immediately. Practice good housekeeping and clean up at the end of the period.
* Aisles and bench-tops must be kept free of obstructions (knapsacks, stools, bags, etc.); all personal belongings must be stored in the cubby holes under the benches.
* Become familiar with the chemicals you will be using before each experiment. Learn the safe handling and disposal requirements. Be aware of the potential for toxic vapour and gases to be produced and work in the fume hoods where indicated. When handling chemicals, keep hands away from the face, eyes and body until you have washed thoroughly.
* Ensure that all equipment is in good working order, and use the appropriate equipment for the task, ex. hotplates for heating flammable chemicals; face shields and protective clothing where indicated, check burner tubing for holes, electrical cords for damage or exposed wires, etc.

**Protecting Yourself against Accidents / Injury**

* Protective clothing:
* Safety Goggles: Splash proof safety goggles are mandatory for the first year chemistry laboratory, this type of goggle gives maximum protection from spills and flying objects.
* Footwear: Shoes must cover the entire foot and have skid-resistant soles.
* Lab Coats: Strongly recommended to protect your skin and clothing.
* Long hair must be secured back while working in the lab
* Food and Drink: Anything you plan to ingest should not be brought into the laboratory. Food or drink brought into the lab will be confiscated.

**Treatment of Injury**

* FIRST AID:

In general, the best First Aid for acid, alkali, or other chemicals splashed on the skin, cuts, abrasions or burns is immediate flushing with large quantities of tap water. Report all accidents and injuries to your instructor or TA as soon as possible in order to ensure proper treatment.

* Chemicals on the skin: If a chemical is splashed or spilled on skin, move to the nearest sink, eyewash or emergency shower and flush the affected area with large quantities of water, inform your instructor, and, if irritation or pain develops, report to Health Services. Locate the emergency shower and eyewash stations in your laboratory room.
* Chemicals in the eye: Locate the emergency eye wash nearest to your workstation. If a chemical enters the eye, flowing fresh water should be used immediately to flush out eye for a minimum of 10 minutes. Have someone inform your instructor. After flushing, report immediately to Health Services.
* Cuts, abrasions and burns: For treatment and dressing of cuts and burns, report immediately to your instructor or TA.

**Emergency contact information**

Major injury or illness:

* Fire / Ambulance / Police: Call 911 from any on campus phone

Minor injury or illness:

* Health Services: 519-888-4096 or ex. 84096
* UW Police (non-emergency): 519-888-4911 or ex. 22222

Other health related concerns:

* Poisoning / Overdose Information: 1-800-268-9017
* Telehealth Ontario (24 hour phone access): 1-866-797-0000

**Fire and Explosions**

Fire is one of the major hazards in the chemistry laboratory. For your own safety, and the safety of others:

* Learn the location of the nearest fire exit, fire extinguisher, fire alarm pull station, emergency safety shower and fire blankets.
* If the fire alarm sounds, turn off all services (gas, electricity, and water) and leave the building immediately via the exit indicated.
* In the case of a fire or explosion in the lab, evacuate the room and close the doors. Pull the nearest wall alarm and leave the building immediately via the exit indicated. Avoid inhaling smoke and gases resulting from fire or explosion.
* If clothing catches fire, **stop** where you are, **drop** to the floor **and roll** to smother the fire. DO NOT RUN.
* Limit flammable liquids to amount actually needed for immediate use.
* Assemble apparatus so that control valves and switches will remain accessible if a fire should occur. Do not set up so that it is necessary to reach through the assembly to turn water, gas or electricity on or off.

**Fire Extinguishers**

Fire extinguishers are located in the hallway outside of the first year chemistry laboratory. These are Multi-purpose Dry Chemical extinguishers (Type ABC) and may be used on most fires:

* **Class A** fires: ordinary combustible materials (paper, wood, most plastics)
* **Class B** fires: flammable / combustible liquids (gasoline, solvents, grease, oil)
* **Class C** fires: electrical equipment (appliances, wiring, circuit breakers, outlets)

**To operate a fire extinguisher, use the PASS technique:**

**P**ull the pin or locking device.

**A**im low, at the base of the fire.

**S**queeze the handle.

**S**weep slowly and evenly across the base of the fire.

**Only attempt to extinguish a fire if:**

* Everyone is leaving the room and someone is dialing 911 to call the fire department.
* The fire is small, not spreading, and the smoke or heat does not pose a threat.
* Your extinguisher matches the type of fire you are attempting to fight.
* You have confidence in fighting the fire, and are familiar with use of the extinguisher.

**Remember: Don’t get trapped by fire. Always keep your back to a clear exit.**

**Safely Handling Chemicals**

Before using a chemical, you should become familiar with the boiling point, flash point, vapour pressure, toxicity, explosive limits, incompatibilities and other special precautions. This information should be researched before the lab, but is also available in the laboratory in the MSDS binders.

Nearly all chemicals are poisonous to the human body to some degree and it is important to use proper caution at all times when handling chemicals. Vapours create most of the dangers in the laboratory. They may be toxic, flammable or both. Chemicals of these types should be handled in ventilated hoods in such a manner that the vapour will be carried away.

When handling chemicals, keep hands (especially gloved ones) away from your face, eyes and skin until you have washed thoroughly.

Never test chemicals by taste. To sample a gas by odour, fan some toward the nose with the hand after filling lungs with air.

Use a rubber bulb to fill a pipette, do not pipette chemicals or start siphons by mouth.

Pour acids into water while agitating, never pour water into acid.

Stoppers should be held out of contact with anything but air while pouring from a bottle.

If a spill occurs chemicals should be flushed off a bottle to protect the next user. Close, re-cap or stopper all chemical containers immediately after use.

Chemicals are generally expensive. An estimation of the quantity required should be made at the beginning of each experiment. Excess chemicals **should not** be returned to reagent bottles, but disposed of in the appropriate waste container or shared with/used by a classmate.

Chemicals that react to give off dangerous gases, cause fire or explosion should not be kept in proximity to each other.

Unlabelled chemicals must not be used.

All spills must be cleaned up immediately. For help with chemical clean-up, ask a TA or instructor. Thoroughly clean and dry lab benches at the end of each lab using the spray provided.

A gas or open flame must never be used to heat flammable liquids. An electric heating mantle, hot plate or steam bath is most desirable.

Neutralize acid or base (clothing, desktop or floor) by washing with plenty of water. Spill kits are available in the storeroom to clean up large amounts of either acid or base.

For each experiment, special disposal containers are provided for waste chemicals, all chemicals must be disposed of in these containers. Nothing goes down the sink drains!

**Safely Handling Glassware**

Laboratory glassware is generally fragile, and many unnecessary and painful accidents have occurred because of improper handling.

* Learn the names of the glassware you will be using in the laboratory so that you can be sure to use the correct item for each procedure.
* Chipped or broken glassware should be discarded into specially marked “Broken Glass” containers for disposal.
* Broken glass should be collected with a brush and dustpan or cardboard. Absorbent cotton may also be used to pick up fine pieces of broken glass. Cotton should be held with tongs. Never use a paper towel to clean up broken glass.
* Glassware that is chipped or cracked can break when heated or cooled, often creating a chemical spill or resulting in injury to the experimenter. Inspect beakers and flasks thoroughly for damage before each use.
* Vacuum flasks will collapse violently under vacuum if cracked, chipped or otherwise weakened. Tamping flasks when suction is on full is an unsafe practice. Erlenmeyer and other thin-walled flat bottom flasks are not safe for use under vacuum. Release any vacuum from all parts of apparatus before disconnecting.
* Carry glass tubing and long glassware (burettes, pipettes, thermometers) vertically rather than horizontally.
* Apparatus that can roll such as thermometers, pipettes, etc., should be placed on bench at right angles to the edge to keep them from rolling onto floor.
* All containers should be completely emptied and rinsed before cleaning. Organic residues can react with strong oxidizing agents.
* Pipettes with ragged-edge or shortened ends should be discarded. Syringes or a propipette should be used for toxic or corrosive materials.