

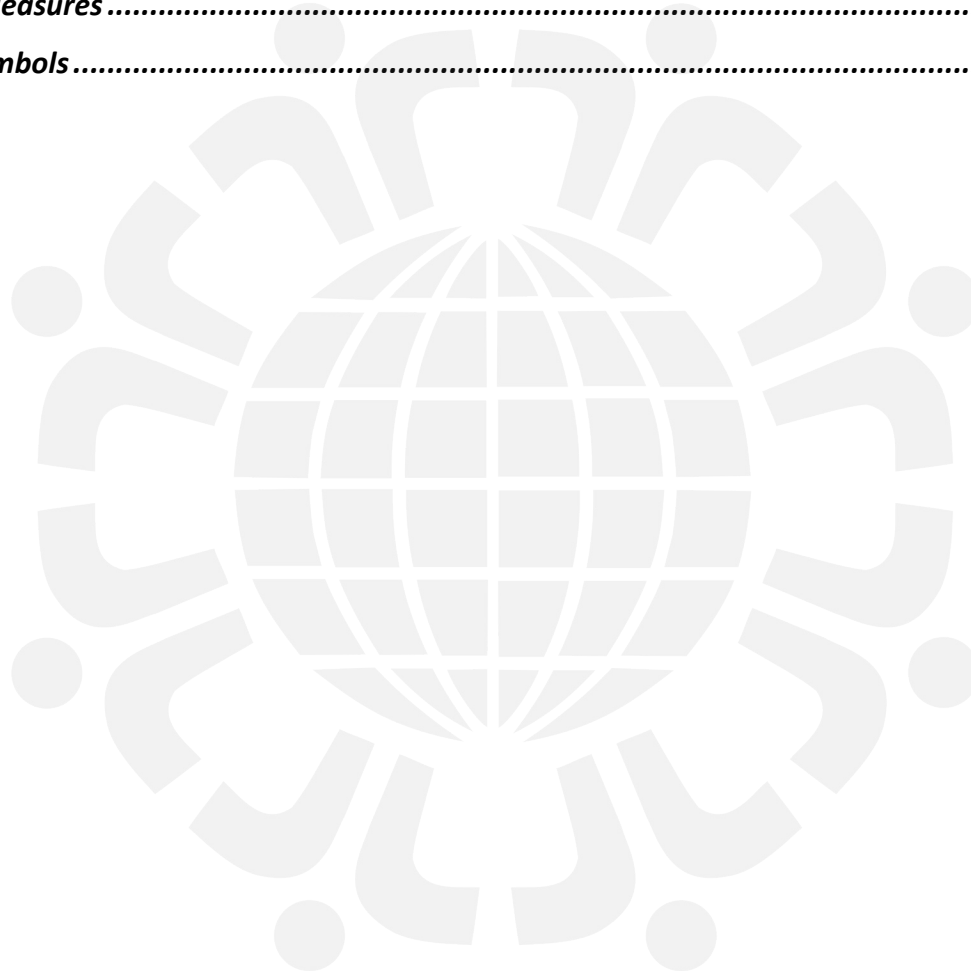


IISU LABORATORY
SAFETY
MANUAL



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IISU Guidelines of Lab Safety

“SAFETY IS FIRST AND MUST FOR ALL”

Safety in the laboratory must be emphasized. The chemicals with which students work in laboratory may have some hazards associated with them. Therefore, it is important to follow the stringent safety rules and precautionary measures outlined in this lab manual for their own safety as well as for safety of their co-workers.

General Conduct

1. It is the responsibility of every staff and student to ensure that the laboratory is a safe environment for everyone.
2. The laboratory is a place for scientific research, and as such, staff and students should not engage in idle gossip while working. Running around and boisterous behaviour will not be tolerated.
3. Undergraduate students shall not be issued with keys/transponders that allow them unrestricted access to labs.
4. Open flames should never be used in the laboratory unless you have permission from a qualified supervisor.
5. Make sure you are aware of where your labs' exit and fire alarms are located.
6. If there is a fire drill, be sure to turn off all electrical equipment and close all containers.
7. Always work in properly-ventilated areas.
8. Do not chew gum, drink, or eat while working in the lab.
9. Laboratory glassware should never be utilized as food or beverage containers.
10. Each time you use glassware, be sure to check it for chips and cracks. Notify your lab supervisor of any damaged glassware so it can be properly disposed of.
11. Never use lab equipment that you are not approved or trained by your supervisor to operate.
12. If an instrument or piece of equipment fails during use, or isn't operating properly, report the same to the technician immediately. Never try to repair an equipment problem on your own.
13. If you are the last person to leave the lab, make sure to lock all the doors and turn off all ignition sources.
14. Do not work alone in the lab.
15. Do not expose electric sparks, open flames and heating elements to organic solvents.
16. Never leave an ongoing experiment unattended.
17. Never lift any glassware, solutions, or other types of apparatus above eye level.
18. Never smell or taste chemicals.



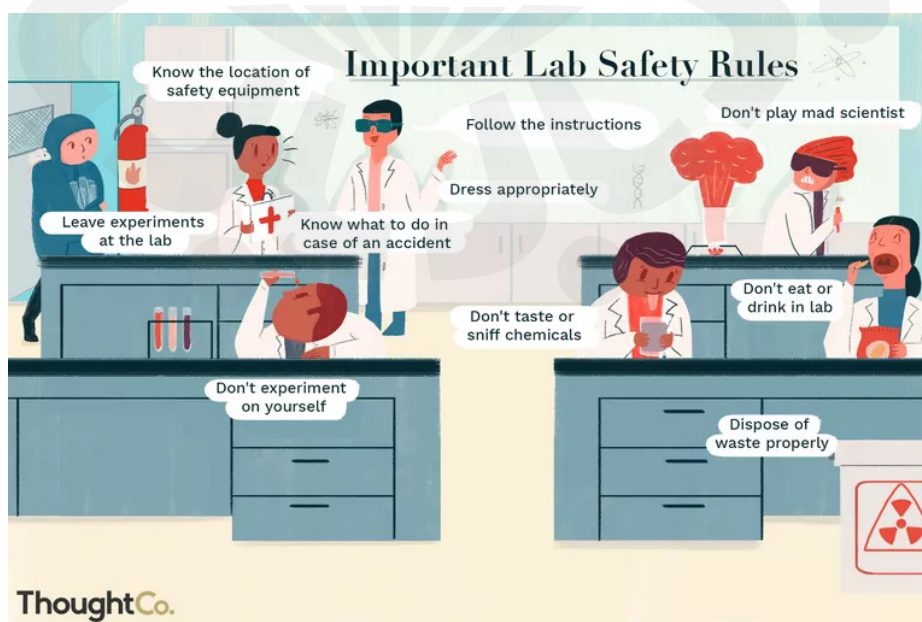
19. Do not pipette by mouth.
20. Make sure you always follow the proper procedures for disposing lab waste.
21. Report all injuries, accidents, and broken equipment or glass right away, even if the incident seems small or unimportant.
22. If you have been injured, yell out immediately and as loud as you can to ensure you get help.
23. In the event of a chemical splashing into your eye(s) or on your skin, immediately flush the affected area(s) with running water for at least 20 minutes.
24. If you notice any unsafe conditions in the lab, let your supervisor know as soon as possible.
25. Be sure to read all fire alarm and safety signs and follow the instructions in the event of an accident or emergency.
26. Ensure you are fully aware of your facility's/building's evacuation procedures.
27. Make sure you know where your lab's safety equipment—including first aid kit(s), fire extinguishers, eye wash stations, and safety showers—is located and how to properly use it.
28. Use emergency phone numbers to call for help in case of an emergency.

Phone Numbers:

**Ms. Agimol Salvi(Infirmary, Opposite CRIT Office, Ground Floor, Main Block):
8003996517**

Mr. Jagdish Singh Rajawat (Lab Assistant):9783307094

Dr. Manisha Patni, HOD, Department of Chemistry:9783307131





Housekeeping safety rules



Source: labmanager.com

Laboratory housekeeping rules also apply to most facilities and deal with the basic upkeep, tidiness, and maintenance of a safe laboratory.

1. Always keep your work area(s) tidy and clean.
2. Make sure that all eye wash stations, emergency showers, fire extinguishers, and exits are always unobstructed and accessible.
3. Only materials you require for your work should be kept in your work area. Everything else should be stored safely out of the way.
4. Only lightweight items should be stored on top of cabinets; heavier items should always be kept at the bottom.
5. Solids should always be kept out of the laboratory sink.
6. Any equipment that requires air flow or ventilation to prevent overheating should always be kept clear.
7. Spilled chemicals must be cleaned up immediately and contaminated materials properly disposed.
8. All laboratory reagents and chemicals must be returned to the appropriate shelves or special storage areas (e.g., refrigerators) immediately after use.

Personal protection safety rules

DON'T BE ON THE WRONG SIDE OF SAFETY

Lab Personal Protective Equipment (PPE)

WRONG	RIGHT
<p>RISKS</p> <p>Not wearing proper eye protection can result in eye injury including blindness from hazardous materials and flying objects.</p>	<p>EYE PROTECTION</p> <p>Safety glasses protect you from impact such as exploding glassware or eye contamination via droplet exposure. Goggles protect against splashes. Face shields can protect against skin burns (e.g. cryo).</p>
<p>RISKS</p> <p>Not wearing a lab coat can cause damage and holes in clothing. It can also result in skin burns, disfigurement, and skin contamination to areas like the wrist. Once outside the lab, you can contaminate your home, lunch areas, etc.</p>	<p>LAB COAT</p> <p>Lab coats protect your skin from hazardous materials (e.g. chemicals, biologicals, radiologicals). You can remove the contaminated layer post-spill, isolating contamination to the lab area. The extra layer can also minimize public body exposure should clothing need to be removed due to a splash.</p>
<p>RISKS</p> <p>Not wearing gloves runs the risk of burns, scars, contamination, and the absorption of hazardous materials.</p>	<p>GLOVES</p> <p>Frequent change of lab gloves when contaminated can prevent burns and toxic side-effects.</p>
<p>RISKS</p> <p>Lack of proper leg coverage can result in burns, scars, contamination, and absorption of hazardous materials.</p>	<p>COVERED LEGS</p> <p>Covered legs provide a layer of protection against hazardous materials.</p>
<p>RISKS</p> <p>Lack of proper footwear can result in broken bones, burns, scars, contamination, and absorption of hazardous materials.</p>	<p>CLOSED-TOE SHOES</p> <p>Closed-toe shoes protect against physical hazards and hazardous materials.</p>

Source: www.ehs.utoronto.ca

Laboratory dress codes set a clear policy for the clothing that employees should avoid wearing in order to prevent accidents or injuries in the lab.

1. Always tie back hair that is chin-length or longer.
2. Make sure that loose clothing or dangling jewellery is secured, or avoid wearing it in the first place.
3. Never wear sandals or other open-toed shoes in the lab. Footwear should always cover the foot completely.
4. Never wear shorts or skirts in the lab.
5. When working with Bunsen burners, lighted splints, matches, etc., acrylic nails are not allowed.



6. When working with equipment, hazardous materials, glassware, heat, and/or chemicals, always wear face shields or safety glasses.
7. When handling any toxic or hazardous agent, always wear the appropriate gloves.
8. When performing laboratory experiments, you should always wear a smock or lab coat.
9. After performing an experiment, you should always wash your hands with soap and water.
10. When using lab equipment and chemicals, be sure to keep your hands away from your body, mouth, eyes, and face.



Source: <https://www.ntu.edu.sg/cee/about-us/laboratories/environment-laboratory/environment-laboratory-safety>



Chemical safety rules

HAZARDOUS MATERIALS CLASSIFICATION



1. All students must be familiar with the potential hazards of chemicals, and follow recommended procedures for their use, handling, storage and disposal. If in doubt, workers should consult the Material Safety Data Sheets (MSDS) concerning the relevant chemicals before commencing their experiments.
2. Every chemical should be treated as though it were dangerous.
3. Do not allow any solvent to come into contact with your skin.
4. All chemicals should always be clearly labelled with the name of the substance, its concentration, the date it was received, and the name of the person responsible for it.
5. Before removing any of the contents from a chemical bottle, read the label twice.



6. Never take more chemicals from a bottle than you need for your work.
7. Do not leave shelf bottles open.
8. Do not point a test tube being heated at another student or yourself.
9. Never look into a test tube while you are heating it.
10. Do not put unused chemicals back into their original container.
11. Chemicals or other materials should never be taken out of the laboratory.
12. Chemicals should never be mixed in sink drains.
13. Flammable and volatile chemicals should only be used in a fume hood.
14. Always be careful when transferring, distilling or refluxing volatile liquids.
15. If a chemical spill occurs, clean it up right away.
16. Ensure that all chemical waste is disposed of properly.

Safety Measures in case of fire

1. Fire prevention is extremely important in labs, where flammable chemicals and naked flames can make a dangerous partnership. Developing and following a proper fire prevention procedure is essential for preventing and containing both small bench-top fires and larger fires.
2. If a solution in the beaker catches fire, cover the beaker with porcelain plate to cut off the oxygen supply.
3. In case of small bench type fire, try to contain the fire using a fire extinguisher. If you can't, call Lab assistant.
4. If there is an immediate danger, raise alarm and evacuate.
5. We, at IISU, have
 - a. ABC powder extinguisher
 - b. Carbon dioxide extinguisher
 - c. Fire Extinguishing ball

Placed just outside the chemistry labs

Mount on the wall near the seating area of lab assistants in the lab

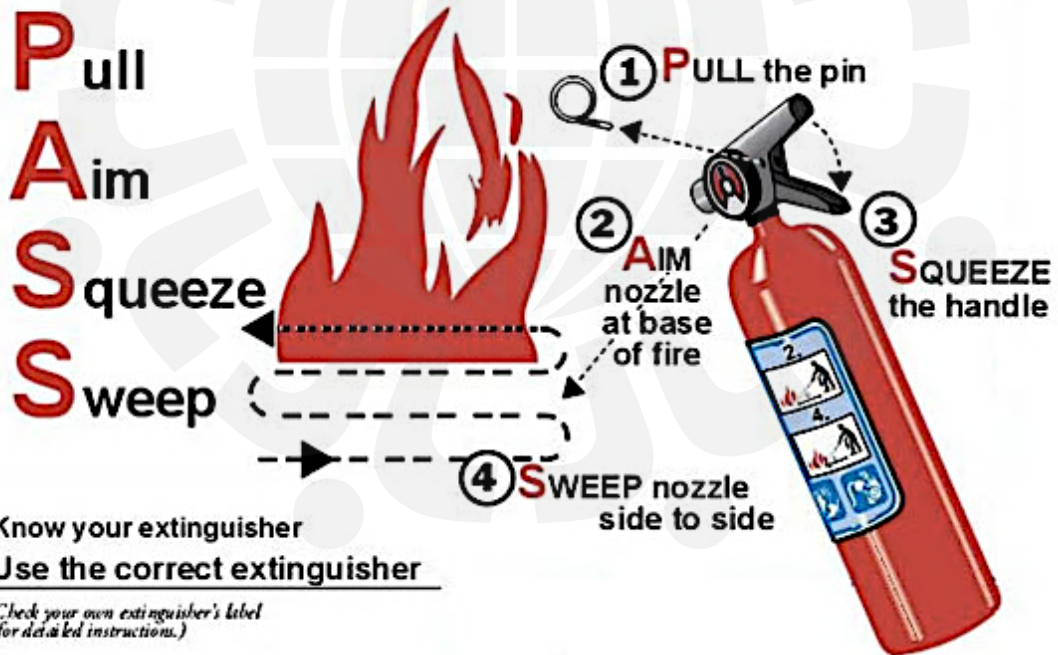


The table given below showcases the use of different types of fire extinguishers in case of different emergencies

TYPE	EXTINGUISHER	WATER	FOAM	POWDER	CO ₂	WET CHEMICAL
A Wood, Paper, Textiles		✓	✓	✓	✗	✓
B Flammable Liquids		✗	✓	✓	✓	✓
C Flammable Gases		✗	✗	✓	✗	✗
E Electrical Fires		✗	✗	✓	✓	✗
F Cooking oils & fats		✗	✗	✗	✗	✓

Source: vsafety.co.uk

To operate an extinguisher:



Source: <https://instrumentationtools.com/fire-extinguisher/>

Fire Extinguishing Ball



Source: www.afofireballs.com

1. Fire Extinguishing Ball is a ball shaped fire extinguisher.
2. Simply thrown into a fire, it will activate within 3 seconds and effectively disperses, extinguishing chemical fire.
3. Fire Extinguishing Ball will self-activate when it comes into contact with fire and gives a loud noise as a fire alarm.

First Aid Measures

1. Accidents do not often happen in well-equipped chemistry laboratories if students understand safe laboratory procedures and are careful in following them.
2. However if something happens, notify the teacher immediately. You should know the location of the first aid kit in the laboratory room.



POISONS

Accidents	Treatments
<i>Acids or Acidic Compounds</i>	Drink plenty of water, followed by milk of magnesia or ant-acids/Tricaine. Eat Banana
<i>Caustic Alkalies or Basic Compounds</i>	Drink plenty of water followed by lemon juice. Eat Banana.
<i>Salts of Heavy Metals</i>	Give milk or white of an egg. Powder the charcoal tablet and give orally with water.
<i>Arsenic or Mercury Compounds</i>	Give emetic immediately (common salt in a glass of water). Powder the charcoal tablet and give orally with water.
<i>Inhalation of Gases</i>	Remove the victim to air, loosen clothing at neck. Inhale dilute vapours of ammonia or gargle with sodium bicarbonate solution.

CUTS / BLEEDING

Accidents	Treatments
<i>Minor</i>	Let it bleed for few seconds. Wash with soap and water. Pat dry. Apply a disinfectant and bandage
<i>Major</i>	Wash with disinfectant, try to stop bleeding by applying pressure to close the wound. consult doctor immediately.

CHEMICAL SPILLS ON SKIN

Accidents	Treatments
<i>Acidic Compounds</i>	Wash with ice-cold water, then with saturated sodium bicarbonate solution and then again with ice-cold water. Apply disinfectant, dry, apply antiseptic cream.
<i>Basic Compounds</i>	Wash with ice-cold water, then with acetic acid (1%) solution and then again with ice-cold water. Apply disinfectant, dry, apply antiseptic cream.
<i>Bromine Burn</i>	Wash liberally with ammonia solution (2%), and then with ice-cold water. Apply glycerine and then antiseptic cream.

Note: If you are not sure whether the compound is acidic or basic, use ethanol to clean and then apply antiseptic cream.

FIRST AID MEASURES

FIRE

Accidents	Treatments
<i>Clothes Catch Fire</i>	Drop to the floor and roll. Use blanket or similar cloth to cut off the air supply.
<i>Minor Fire</i>	Switch off the burner and try to put the fire off by cutting off the air supply (try to cover with wire gauge or a big utensil having lid or put sand or water). Remove igniting materials. Extinguish small fire by covering the opening of the vessel with a damp cloth or duster.
<i>Major Fire</i>	Leave the lab immediately. Stay low while evacuating if room is filled with smoke. Call fire brigade.

BURNS

Accidents	Treatments
<i>Minor Burn</i>	Wash with tap water followed by ice-cold water and apply antiseptic cream like betadine / silversulphadiazine / soframycin/ burnol etc. Or Apply sodium chloride past and then apply wet cloth gauze.
<i>Major Burn</i>	Keep it dipped in ice-cold water. Consult doctor immediately.
<i>Direct Heat Burn</i>	Use ice-pack and apply suitable antiseptic cream.
<i>Stream Burn</i>	Wash with ice water or use ice-pack Apply suitable antiseptic cream.

EYE ACCIDENTS

Accidents	Treatments
<i>Acid in Eye</i>	Wash thoroughly with water and then with sodium bicarbonate solution.
<i>Alkali in Eye</i>	Wash thoroughly with water and then with boric acid solution.
<i>Glass in Eye</i>	Remove glass gently. Do not rub eyes.
<i>Irritation in Eye</i>	Wash thoroughly with water. Use chloromycetin capsules

DISTILLED WATER AMPULES should be preferred for cleaning eye or else ensure that while washing eyes with water, the hands must be clean.

USE EYE WASHING STATION



Hazard Symbols

GUIDE TO GHS

(Globally Harmonized System of Classification and Labeling of Chemicals)

HAZARD SYMBOLS



EXPLOSIVE
Substances that can produce an explosion if released suddenly

CORROSIVE
Strong chemicals that can damage your skin or any other substances.

LONGER TERM HEALTH HAZARD
Causes serious health damage including reproductive toxicity, problems with your respiratory system, germ cell mutagenicity, carcinogenicity etc.



HAZARDOUS TO AQUATIC ENVIRONMENT
Chemicals that are potentially hazardous to the environment – if not properly disposed of, they can contaminate soil and water, and can be lethal for aquatic animals and trees.

OXIDISING
Can provide oxygen to flammable substances to burn when used in lab. Must be stored separately from flammables.

ACUTE TOXICITY
Highly harmful substances that cause death if swallowed, inhaled or absorbed through the skin.



FLAMMABLE
Highly harmful substances that cause death if swallowed, inhaled or absorbed through the skin.

CAUTION
Substances that irritate eyes and skin causing itchiness, soreness, redness and blistering.

GASES UNDER PRESSURE
Hazardous because of high pressures inside the cylinders. Gas can be released deliberately by opening the cylinder valve, or accidentally from a broken or leaking valve or from a safety device

Source: http://www.rsc.org/images/labelling-system_tcm18-219164.pdf