



CHEMICAL ENGINEERING LABORATORY SAFETY GUIDE

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1. INTRODUCTION

This guide covers laboratory health and safety measures that Faculty of Engineering, chemical engineering department applies. All students, laboratory associated and faculty members must read this document and be aware of safety procedures and restrictions mentioned in this guide. In addition, a detailed laboratory safety session shall also be given by CHE faculty member of chemical engineering department prior to laboratory access; students must adhere to all written and verbal safety instructions throughout the academic term. Also, it is obligatory for students to attend lab specific trainings at the beginning of the term or before attending the first lab session.

It should be mentioned here, along with all the safety measures and precautions; a person's safety depends mostly on himself. Efforts have been made to address situations that may create a hazard in the lab but the information and instructions provided cannot be considered all-inclusive.

The Health and Safety Program Structure

- To identify the potential risks, dangers and hazards in the working area
- To make provisions against accidents
- To provide consultancy about occupational health and safety

2. PURPOSE

The purpose of this booklet is to provide basic safe operating practices to be applied uniformly in all laboratories in order to ensure a safe environment in which to work and study for faculty, students, visitors, and staff. New situations and hazards arise in teaching labs and research every day. This document, therefore, cannot possibly be an all-inclusive list of hazards or solutions to hazards found in college laboratories and research centers. Instead, it is offered as the foundation and guide to approach new challenges and discover ways of safely dealing with them.

3. GENERAL LAB SAFETY

A person who works in the laboratory must be familiar about potential hazards in the laboratory. Laboratory users must attend a general session given by Lab supervisor and receive additional and more specific training from the responsible faculty member.

The training session covers the environmental health and safety standards and documents, hazards in the laboratories, personal protective equipment (PPE), waste disposal, safety signs and emergency situations.

The students are recommended to join the AIChE programs (<https://www.aiche.org/students/membership>) for safety training to get familiar with the lab safety for safe working in Laboratories (<https://www.aiche.org/ccps/education/safety-and-chemical-engineering-education-sache-certificate-program>) . This Program is free of cost for undergraduate students of any level.

This training is mandatory for all the newcomers; students, academic staff, project staff and visitors. Our students and selected faculty members should be members to follow this training session.

4. Safety Guidelines & Rules

The following guidelines have been established to minimize or eliminate hazards in the laboratory to maintain a safe laboratory environment. It is the responsibility of each person that enters into the laboratory to understand the safety and health hazards associated with potential hazardous materials and equipment in the laboratory. It is also the individual's responsibility to practice the following general safety guidelines at all times:

1. Students and staff must use the face mask when in groups to protect themselves from the Covid-19 infections.
2. Never perform any hazardous and non-hazardous work when alone in the laboratory. At least two people should be present. Undergraduate students must be supervised by an instructor at all times.
3. Never remove chemicals, biological agents, or radioactive materials from the facility without proper authorization.
4. Chemical fume hood windows should be kept closed whenever possible. Maintain the minimum possible opening when working.
5. Do not store chemicals in fume hoods.
6. Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in areas where specimens are handled.
7. Food and drink should not be brought into, stored in or consumed in a laboratory.
8. Any Consumable/Eatables are not to be stored in refrigerators, freezers, cabinets, or on shelves, countertops, or bench tops where blood or other potentially infectious materials are stored or in other areas of possible contamination.
9. Confine long hair and loose clothing. Do not wear high-heeled shoes, open-toed shoes, sandals or shoes made of woven material.
10. Always wash hands and arms with soap and water before leaving the work area. This applies even if you have been wearing gloves and:
 - a. After completion of work and before leaving the laboratory.
 - b. After removing gloves.
 - c. Before eating, drinking, applying cosmetics, changing contact lenses or using lavatory facilities.

- d. Before all other activities which entail hand contact with mucous membranes or breaks in the skin.
 - e. Immediately after accidental skin contact with blood or other potentially infectious materials.
 - f. Between patient contact and before invasive procedures
11. Visitors to the laboratory must observe all safety regulations, including, but not limited, to the wearing of eye protection.
 12. Appropriate eye protection should be worn, when using toxic chemicals or operating mechanical equipment.
 13. Lab users should know the locations and operation of safety and emergency equipment such as fire.
 14. Extinguishers, first aid kits, emergency eyewash stations and emergency showers, emergency power off, emergency telephones, and emergency exits.
 15. Unauthorized person(s) will not be allowed in a laboratory. 'Authorized' students or any other individuals have to be under immediate and direct supervision of a qualified authorized person at all times.
 16. Never open or remove the cover of any equipment in the laboratories. Furthermore, Laboratory should remain locked after regular office hours.
 17. Report all problems to the lab supervisor and avoid misuse of equipment for purposes other than that for which they are intended.
 18. Maintain dry conditions on the equipment and avoid spillage of water.
 19. Do not handle the water without wearing gloves as there may be contamination.
 20. Do not use wet hand when using electrical items like switches or plugs.
 21. Do not physically contact any of the rotating components of the equipment.
 22. Remove the unwanted items immediately. Loose clothes, books and note books should be kept outside.
 23. All spilled liquids should be cleaned immediately.
 24. Students should make themselves familiar with the experimental control system before you start using it.

It is the responsibility of everyone working in the laboratory to make certain that the laboratory is left clean after work is performed.

5. Responsibility

It is the responsibility of the faculty member teaching the lab-course to ensure that the procedures described in this document are implemented by the lab instructors.

5.1. Lab Instructor Responsibility

5.1.1. Duty of Instruction

This task involves providing adequate written instruction before the commencement of any laboratory activity that is accurate, appropriate to the situation, setting, and maturity of the audience. The instructor should address reasonably foreseeable dangers, identify and clarify any specific risk involved, explain proper procedures to be used, and present comments concerning appropriate/inappropriate conduct in the lab.

5.1.2. Duty of Supervision

This includes adequate supervision as defined by professional and regulatory guidelines to ensure students behave properly in light of any foreseeable dangers. It should be noted that misbehavior of any type should not be tolerated and failure to act properly is the responsibility of instructor for maintaining the safe work zone. It is equally important to note that the greater the degree of danger, the higher the level of supervision that will be required and the younger the age of students or the greater the degree of inclusion of special population students, the greater the level of supervision required. Students should not be left unattended, except in an emergency where the potential harm is greater than the perceived risk to students. Even then, the risk should be minimized or responsibility transferred to another authorized person if the situation permits.

5.1.3 Duty of Maintenance

This duty includes ensuring a safe environment for students and teaching/research staff. The lab instructor should ensure that defective equipment is not used for any reason and written reports for maintenance/correction of hazardous conditions or defective equipment with responsible administrators are properly filed. The lab instructor should as well establish regular inspection schedules and procedures for checking safety and first-aid equipment, and follow all safety guidelines concerning proper labeling, storage, and disposal of chemicals. By properly keeping records of all hazard notifications and maintenance inspections, the instructor's liability in the event of an accident is tremendously minimized in cases where no corrective actions were subsequently made.

5.2 Students' Responsibility

The students are required to duly observe the '**SAFELAB**' rules.

- Supervision: never work in the lab without the supervision of a competent person.
- Attention: always pay attention to the work and do not play around in the lab.
- Follow instructions: always perform experiments precisely as directed by the supervisor.

- Emergency readiness: know what to do in the event of an emergency.
- Labeling: always check labels to verify substances before using them, and properly ensure that substance are labeled in containers before usage.
- Apparel: always wear appropriate protective equipment and apparel.
- Brains: use your brain wisely - safety begins with you.
- Responsible to read and understand the experiments before conducting them and to be aware of any activity is going to do in the laboratory (e.g. design etc.).
- Responsible use of equipment following the user manuals and instructor advice
- Responsible to follow the instructor instructions.
- Responsible to leave the class only after warning the instructor.
- Responsible to report any safety concern to the instructor.
- Responsible to take care of the colleague's safety.
- Responsible for cleaning the workplace after the experiment and switch off the equipment.
- Responsible not to introduce any dangerous object, substance, and not to use food and drinks in the lab.
- Responsible for storing in a safe place bags and other material in order to avoid dangers or difficulties during the Lab time or after.
- Responsible to follow the safety procedures, manuals, related to the Laboratory and its devices.
- Responsible for safe behavior (e.g. sitting only on chairs, maintain discipline and order etc.).



6. Personal Protective Equipments (PPE):

PPE is protective equipment that is worn, such as safety glasses, lab coats, aprons, respirators, etc. PPE is considered a second line of defense against work place hazards and may only be used when other means of protections are not adequate or not feasible.

Personnel (faculty, students and technicians) must be aware of the types of protective equipment available and use the proper type for each job. Everyone, including visitors, must wear the appropriate eye protection where chemicals are stored or handled. Appropriate PPE should be used where indicated:

PPE includes:

- Eye protection (Goggles),

- Gloves,
- Laboratory coats... etc.,
- Respirators,
- Face masks
- Appropriate foot protection

6.1. Eye and Face Protection

Safety glasses or chemical goggles must be put on before entering any wet bench lab, including cell culture labs. This applies to lab visitors, as well as staff and students.

Table 6.1. Types of Eye Safety Glasses

Safety glasses	Splash goggles	Laser goggles	Face shields
Safety glasses provide eye protection from moderate impact and particles associated with grinding, sawing, scaling, broken glass, and minor chemical splashes, etc.	Splash goggles provide adequate eye protection from many hazards, including potential chemical splash hazards, use of concentrated corrosive material, and bulk chemical transfer.	The lens of the eyewear is a filter/absorber designed to reduce light transmittance of a specific wavelength. The lens can filter out a specific wavelength while maintaining adequate light transmission for other wavelengths.	Face shields provide additional protection to the eyes and face when used in combination with safety glasses or splash goggles. Face shields consist of an adjustable headgear and face shield of tinted or clear lenses or a mesh wire screen.
			

(Images courtesy of Egebant)

Adopted from Cornell University Environmental Health & Safety Department.

Face shields worn over safety glasses may be required for certain processes as determined by the faculty member or supervisor.

Face shields must always be worn over safety glasses or goggles, **not** instead of safety glasses or goggles.

Processes involving high pressure reactors (>30 PSI) or pneumatic lines (>30 PSI) require the use of face shields over safety glasses.

6.2. Head Protection

Head protection is necessary if you work where there is risk of injury from moving, falling, or flying objects or if you work near high-voltage equipment.



Figure 6.1: Head Cover

6.3. Hand Protection

Most accidents involving hands and arms can be classified under four main hazard categories:

- Chemicals
- Abrasions
- Cuts
- Heat/Cold

6.3.1. Gloves

There are several types of a glove that provide protection against and oppose corruption and pervasion to chemicals.

While there is no single glove material that provides 100% protection from all chemicals, a good all purpose glove is the nitrile exam glove. Latex gloves, which have been the most commonly used glove in labs for many years are not resistant to many of the most common solvents found in laboratories. Additionally, latex is a natural product and is also a powerful allergen which readily becomes airborne on glove powder each time a glove is removed. Most hospitals have banned the use of powdered latex gloves. Many institutions including Jazan University are avoiding use of latex gloves entirely.

Table 6.2: represents the types of gloves

Latex gloves	Resistant to ketones, alcohols, caustics, and organic acids.	
Nitrile gloves	Resistant to alcohols, caustics, organic acids, and some ketones.	
Cryogenic gloves	Cryogenic gloves are used to protect hands from extremely cold temperatures.	
PVA Gloves	Resistant to chlorinated solvents, petroleum solvents, and aromatics.	
Cut-resistant gloves	Cut resistant gloves are gloves designed to protect the wearer's hands from cuts while working with sharp tools.	
Heat-resistant gloves	Working with metal and glass forming and hot surfaces requires gloves that offer the highest level of protection against the multiple hazards of a high-heat workplace.	

(Images courtesy of Egebant)

Adopted from Cornell University, Environmental Health & Safety department.

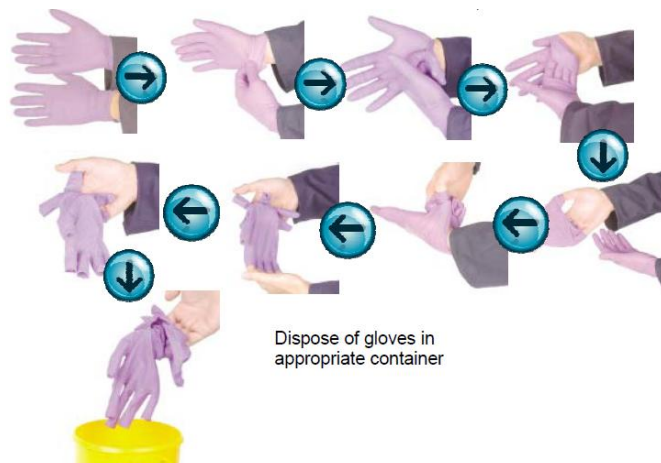


Figure 6.2. How to Remove Gloves (without contaminating yourself)

6.4. Clothing Protection

Loose or torn clothing should be avoided without wearing a lab coat because of the ignition, adsorption, and entanglement in machinery risks.

Dangling jewellery, finger rings or other tight jewellery and excessively long hair should also be avoided.

6.4.1. Lab Coats

It is mandatory to wear lab coat before entering the lab and all personnel are not allowed to enter without wearing the lab coats. When properly used, lab coats:

- Provide protection of skin and personal clothing from incidental contact and small splashes.
- Prevent the spread of contamination outside the lab.
- Provide a removable barrier in the event of an incident involving a spill or splash of hazardous substances.

Specification of recommended lab coat:

- Shall cover the wearer to the knees
- Shall be put on before handling chemicals, biologicals, or unsealed radiological sources.
- Must be made of 100% cotton or flame resistant material.



Figure 6.3. Lab Coat

Wear Lab coats only when in the lab or work area. Remove lab coats when leaving the lab/work area to go home, to lunch, to the restroom, or meetings in the conference rooms, etc.





6.5. Respiratory Protection

A respirator is a device designed to protect the wearer from inhalation of harmful substances.

When chosen correctly and used properly, respirators can protect the wearer from:

1. Fumes and smokes (welding fume)
2. Harmful dusts (lead, silica, and other heavy metals)
3. Gases and vapors (chemical exposures)
4. Oxygen deficiency (oxidation, displacement, and consumption)
5. Biological hazardous (tuberculosis, whooping cough, flu viruses, Covid)

Table 6.3. Types of Masks

<p>N-95 Face Mask</p>	<p>A disposable N95 mask (respirator) is a safety device that covers the nose and mouth and helps protect the wearer from breathing in some hazardous substances. An N95 mask protects you from breathing in small particles in air such as dust, mold, flu viruses.</p>	
<p>Dust mask</p>	<p>The use of the term “dust” mask for the non-rigid soft felt mask is somewhat of a misnomer since, in modified forms, they can be used for other applications such as limited protection against paint fumes, moderate levels of organics, acid fumes, mercury, etc., although their biggest use is against nuisance dust.</p>	
<p>Half face respirator</p>	<p>The half-face cartridge respirator is the type most frequently used, especially in atmospheres in which there is little or no problem of irritation or absorption of material through the skin.</p>	
<p>Full face respirator</p>	<p>Full-face air-purifying respirators are similar in many respects to half-face respirators, with the obvious difference that the mask covers the upper part of the face, protecting the eyes.</p>	

(Images courtesy of Egebant)

6.6. Hearing Protection

Depending on your level of exposure, you may choose from the following devices:

- Disposable earplugs
- Reusable earplugs
- Headband plugs
- Sealed earmuffs



Figure 6.4. Hearing Protection

1.1. Foot Protection

This is due to the potential exposure to toxic chemicals and the potential risk associated with physical hazards such as dropping pieces of equipment or broken glass being present. In general, shoes should be comfortable, and leather shoes are preferable to cloth shoes due to the better resistance of leather compared to cloth. Leather shoes also tend to absorb fewer chemicals than cloth shoes. However, leather shoes are not designed for long term exposure to direct contact with chemicals. In such instances, chemically resistant rubber boots are necessary.



Figure 6.5. Steel-toed shoes and shoes cover (Egebant)

Table 6.4. PPE selection guide by task

	If your task/activity involves:	Use the following PPE:
Chemicals	Solids of low or moderate toxicity	<ul style="list-style-type: none"> • Disposable gloves
	Minimal amounts of liquids (less than 0.1 L) with acute or chronic toxicity	<ul style="list-style-type: none"> • Safety glasses or goggles • Appropriate chemical-resistant gloves • Clothing covering to knees
	More than minimal amounts of liquids with acute or chronic toxicity (pure chemicals, mixtures or solutions)	<ul style="list-style-type: none"> • Safety glasses or goggles • Appropriate chemical-resistant gloves • Lab coat • Acid-resistant apron if more than 4 liters of highly corrosive chemicals used • Consider flame-resistant lab coat if more than 4 liters of flammable liquids used
	Cryogenic liquids	<ul style="list-style-type: none"> • Safety glasses or goggles • Face shield required if handling cryovials stored in liquid phase • Insulated cryogenic gloves • Lab coat recommended
	Potentially explosive compounds	<ul style="list-style-type: none"> • Safety goggles • Face shield • Heavyweight gloves • Fire-resistant lab coat
	Pyrophoric (air-reactive) solids or liquids	<ul style="list-style-type: none"> • Safety glasses or goggles • Face shield recommended • Fire-resistant gloves • Appropriate chemical-resistant gloves • Fire-resistant lab coat
	Particularly hazardous substances including carcinogens, reproductive toxins, and reagents of high acute toxicity	<ul style="list-style-type: none"> • Safety glasses or goggles • Appropriate chemical-resistant gloves • Lab coat • Respirators as needed
Biological Materials	BL1 microorganisms or viruses	<ul style="list-style-type: none"> • Disposable gloves
	BL2 microorganisms, viruses, viral vectors, human materials or old world primate materials Procedures outside of the biosafety cabinet without splatter guard when splashes or sprays are anticipated	<ul style="list-style-type: none"> • Disposable gloves • Lab coat • Safety glasses or goggles • Disposable gloves • Lab coat
Radiation	Unsealed radioactive materials or waste	<ul style="list-style-type: none"> • Safety glasses if there is a splash potential • Nitrile or other appropriate gloves • Lab coat
	Class 3B or 4 laser and if UV laser	<ul style="list-style-type: none"> • Appropriate eye protection • Gloves • Lab coat
	Laser(s) modified by optics	<ul style="list-style-type: none"> • Appropriate eye protection
	Open ultraviolet light source <ul style="list-style-type: none"> • and if face enters UV beam • and if hand enters UV beam • and if body enters UV beam 	<ul style="list-style-type: none"> • Safety glasses or goggles with UV protection • UV face shield • Gloves • Lab coat
	Infrared-emitting equipment	<ul style="list-style-type: none"> • Appropriately-shaded goggles • Lab coat
Other Hazards	Handling hot surfaces and objects such as autoclaved materials and heated glassware	<ul style="list-style-type: none"> • Heat-resistant gloves • Lab coat
	Glassware under pressure or vacuum	<ul style="list-style-type: none"> • Safety glasses or goggles • Face shield recommended • Lab coat
	Cutting and connecting glass tubing	<ul style="list-style-type: none"> • Safety glasses or goggles • Cut-resistant gloves
	Sonicator or other loud equipment	<ul style="list-style-type: none"> • Ear plugs










Adopted from Harvard University, Environmental Health & Safety Department.

2. Chemical Storage and Identity

2.1. Chemical and Labels

- Store cryogenics (liquid nitrogen & dry ice) separately from other chemicals & in well ventilated areas.
- Use proper PPE (including eye protection) when handling and moving cryogenics.
- Do not use cryogenics in closed areas.

Table 6.5. Chemical safety labels

GHS PICTOGRAMS			
Health Hazard Carcinogens, respiratory sensitisers, reproductive toxicity, target organ toxicity, germ cell mutagens 	Flame Flammable gases, liquids, & solids; self-reactives; pyrophorics; 	Exclamation Mark Irritant, dermal sensitiser, acute toxicity (harmful) 	
Gas Cylinder Compressed gases; liquefied gases; dissolved gases 	Corrosion Skin corrosion; serious eye damage 	Exploding Bomb Explosives, self-reactives, organic peroxides 	
Flame Over Circle Oxidisers gases, liquids and solids 	Environment Aquatic toxicity 	Skull & Crossbones Acute toxicity (severe) 	

2.2. Safety Data Sheets

- ❖ All laboratories should maintain Material Safety Data Sheet (MSDS) for chemicals supplied by the manufacturer, distributor, or importer and it must be readily accessible to laboratory workers. (<https://www.msds-online.com/sds-search/>) .
- ❖ MSDSs are written or printed materials regarding a hazardous chemical. Employers must have an MSDS in the place of work for each hazardous chemical in use.
- ❖ MSDS sheets must comprise: 1. Name of the chemical; 2. Manufacturer's information; 3. Hazardous ingredients/identity information; 4. Physical/chemical characteristics; 5. Fire and explosion hazard data; 6. Reactivity data; 7. Health hazard data; 8. Precautions for safe handling and use; and 9. Control measures.

2.3. Signage

The following safety information should be provided in a posted signage:

- Exits.
- Fire Extinguishers.
- Eye Washes.
- Chemical and supply storage areas (including the OSHA's National Fire Protection Agency (NFPA) rating diamond).
- Gas Lines.
- Specific depositories (e.g. bio-hazardous waste, glass, chemical, garbage).
- Distinguish between potable (movable), non-potable, and deionized water sources.
- Diagram of the classroom that includes the location of items listed in above points.
- Emergency plan and phone numbers.

Safety signs and signals to be used should include

Prohibiting signs in round shape complying to ISO 7010 standards.

(<https://www.iso.org/obp/ui/#iso:std:iso:7010:ed-3:v2:en>)

3. EMERGENCY MANAGEMENT

Emergency Planning and Response is Based on Four Principles:

1. Anticipation: It means the emergency planning and the response.
2. Recognition.
3. Evaluation.
4. Control.

Examples for applying these principles:

- If people are expected to use extinguishers, they must be trained.
- Clearly post each room with emergency phone numbers. And after hours phone numbers/person(s) to be contacted.
- Centrally locate safety showers and eyewashes. And teach students to properly use the Safety Shower. Depending on the severity, it should be used until the emergency services arrive if the hazard or accident is serious.
- Centrally locate spill clean-up kits.
- Clean up spill: only if you know the chemical hazards have appropriate equipment and are trained to do so!

8.1. Emergency Procedure

- Cleanse up every small spills instantaneously. If the observed spill is humongous and is presumed to lead to a major risk to others in the laboratory, immediately finish the process or device if practicable, and contact some expert for support.

- If in any case evaporative, combustible, or noxious solvent spills off, close down flames and spark-emanating devices immediately and leave the workspace and contact one of the expert staff for support who can deal with such situation.
- In the matter of fire or flares, contact some expert for help & support.
- Keep a clear track to all safety devices at every times.

Because of the above considerations described above, the National Institute for Occupational Safety and Health (NIOSH) recommends a specific spill kit for responding to nanomaterials spill. Laboratories working with these materials should review the NIOSH spill management guidance and develop specific procedures for managing these events.

The information above is based on NIOSH publication no. 2012-147: General Safe Practices for Working with Engineered Nanomaterials in Research Laboratories (<https://www.cdc.gov/niosh/docs/2012-147/pdfs/2012-147.pdf>).

However, best practices in this field are evolving rapidly and these other references should be reviewed to assure that the current information is being used in managing the safety and health aspects of your work.

8.2. Emergency Equipment and Facilities

Emergency equipment and facilities includes:

- Emergency Telephones and Posted Telephone Numbers(National Emergency Numbers)
- Showers and Eyewash Stations
- Chemical Spill Control Equipment
- Fire Alarm System
- Fire Extinguishers
- Fire Blankets
- First Aid Kit

8.2.1. Emergency Telephones and Posted Telephone Numbers







Every lab should have a clearly marked phone with emergency telephone numbers listed next to it. If there is no phone in the lab, there must be an alternative written plan for contacting emergency or other personnel. This alternative plan must be clearly posted in the laboratory. Specific telephone numbers posted should be indicated above.

8.2.2. Using the Fire Extinguisher

Portable extinguishers must be present in all laboratories, chemical storage and preparation areas. In the event that a fire extinguisher is used, the following four steps should be duly taken '**PASS**':

- **Pull** the pin out on the extinguisher.
- **Aim** the extinguisher at the base of the fire.
- **Squeeze** the nozzle to release extinguishing material.
- **Sweep** side to side.

Table 8.1. Fire Extinguisher Chart

TYPE	COLOUR		WHERE USED	COMMENTS
WATER	All red		Fire Class A <ul style="list-style-type: none"> • Wood • Paper • Textiles • Rubbish etc. 	Dangerous when used on electrical, flammable liquid and cooking oil/fat fires.
FOAM	Red body, blue band		Fire Class A - B <ul style="list-style-type: none"> • Wood • Paper • Textiles • Rubbish etc. • Flammable Liquids 	Dangerous if used on electrical fires.
WET CHEMICAL	Red body, cream band		Fire Class A - F <ul style="list-style-type: none"> • Wood • Paper • Textiles • Rubbish etc. • Cooking Oils and Fats 	Dangerous if used on electrical fires. <i>Protect eyes as this is highly corrosive.</i>
CARBON DIOXIDE	Red body, black band		Fire Class A - B - (E) - F <ul style="list-style-type: none"> • Wood • Paper • Textiles • Rubbish etc. • Flammable Liquids • Live Electrical Equipment • Cooking Oils and Fats 	Not generally suited for outdoor use. Small contained fires only.
DRY CHEMICAL	Red body, white band		Fire Class A - B - (E) Powder Extinguisher Type 1 <ul style="list-style-type: none"> • Wood • Paper • Textiles • Rubbish etc. • Flammable Liquids • Live Electrical Equipment 	Cars Boats Caravans
	Red body, white band		Fire Class B - (E) and can be used on F Class fires Powder Extinguisher Type 2 <ul style="list-style-type: none"> • Flammable Liquids • Live Electrical Equipment • Cooking Oils and Fats 	Kitchen General Household

8.3. Standard Operating Procedures (SOPs)

Laboratory safety practices must be followed when working with chemicals in a laboratory. These include general and laboratory-specific procedures for work with hazardous chemicals. SOPs are recommended for all procedures that pose a potential risk to the health and safety of personnel.

I-CHE-LOF

Table 9. Laboratory Specific Orientation Form

Laboratory Specific Orientation Form			
Student Name		Student ID	
Faculty/Supervisor		Course Name	
Lab No./Name		Group No.	
Day		Date	

Item No.	Items discussed
1.	Location of the nearest building emergency exit
2.	Location of the nearest fire alarm pull station
3.	Location of emergency assembly point, in the event of evacuation
4.	Keeping clear of the emergency exits and locations
5.	Number and location of available eyewashes
6.	Number and location of available safety showers
7.	Number, type and location of available fire extinguishers
8.	Wearing safety glasses at all times
9.	Wearing lab coats, storage and laundry policy for them
10.	Wearing gloves, types and location of them
11.	Spill kit usage and location
12.	Waste accumulation area location
13.	Waste accumulation rules (labels, secondary containers, storage conditions)
14.	Waste pick up calls
15.	Sharps disposal
16.	Fume hood operation, alarms
17.	Fume hood emergency setting (when applicable)
18.	Location of electrical boxes/power kill switch
19.	Chemical storage: flammable cabinet, acid, base storage
20.	Hydrofluoric acid (HF) hazards, handling instructions, and the location of PPE and eyewash kit
21.	Nano materials, hazards, handling instructions, Personal protective equipment (PPE).
22.	lasers

Student Signature	
Faculty/Supervisor Signature	

II-CHE-LCF

Table 10. Laboratory Check-Out Form**Under-graduate Student****Student Name:****Student ID:****Program:****Lab No/Name:****Faculty Member/Supervisor:**

Tasks	Date Completed	NA
Working area vacated and cleaned		
All samples (chemical/biological/electronic) disposed		
PPE handed over to Lab Supervisor (Goggles, Face shield, etc)		
Lab keys handed over to Lab Specialist		
All tools and equipments handed over to Lab Specialist		
Lab notebooks and research documentation transferred to Responsible Faculty Member		
Lab visit performed with Faculty Member		

Approved by			
	Initials	Signature	Date
Under-graduate Student			
Laboratory Coordinator			
Faculty Member/Supervisor			

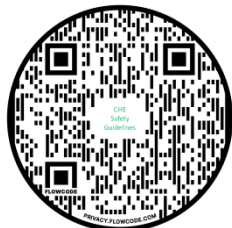
II-CHE-LDF

DECLARATION

Before you sign the declaration please make sure you have understood all aspects of laboratory and chemical safety and you are confident enough to use equipment and chemicals.

I have read the safety guide and familiarized myself with the laboratory, equipment and chemical safety issues and have acquired all the know-how and the necessary training for safe working in the laboratory. I shall adhere to all safety guideline and safe working practices during my laboratory work as explained to me during the orientation session and the COSHH assessment.

Safety Info. QR Code:



Name ----- Signature ----- Date -----

12. References

- <https://www.aiche.org/academy/courses/ela954/sacher-certificate-program-lab-safety>
- <https://cheme.mit.edu/resources/laboratory-safety/>
- <https://www.ehs.gatech.edu/chemical/lsm>
- <http://labsafety.sabanciuniv.edu/>
- Laboratory Safety Guidance, Occupational Safety and Health Administration, U.S. Department of Labor OSHA 3404-11R, 2011
- Princeton University Environment Health and safety (2015, March). Retrieved from <https://ehs.princeton.edu/>
- University of California, Berkeley Environment Health and safety (2015, March). Retrieved from <https://ehs.berkeley.edu/training>
- Harvard University, Environment Health and safety, <https://www.ehs.harvard.edu/programs/lab-safety-assessments-inspections>
- Cornell University, Environment Health and safety, <https://ehs.cornell.edu/>
- http://en.egebant.com.tr/portfolio_category/personal-safety/
- <https://www.aiche.org/students/membership>
- <https://www.aiche.org/ccps/education/safety-and-chemical-engineering-education-sacher-certificate-program>
- <https://www.msdsolnline.com/sds-search/>