Laboratory Safety

INTRODUCTION

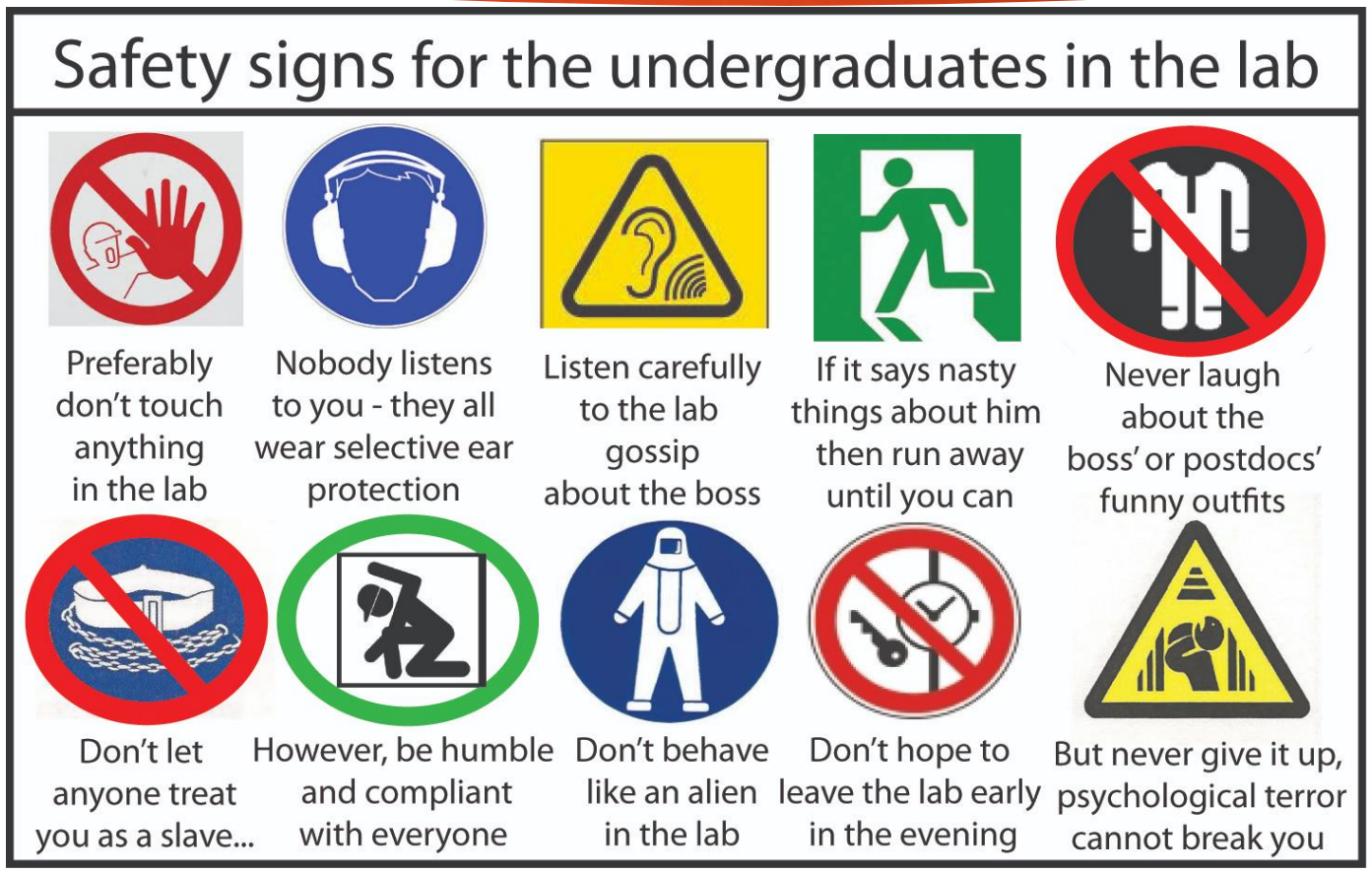
- Students, Teachers, Researchers and Technicians who work in laboratories are exposed to the various hazards chemicals.
- Most of the workplace have hazards chemicals that are well recognized with wel-denned actions to control the situations.
- In laboratories, involves a greater variety of possible hazards chemicals and some of these hazards chemicals needs to take precautions.
- In the all laboratory widely used 'laboratory Safety Rules' procedures are listed below.

DEFINITION OF HAZARD

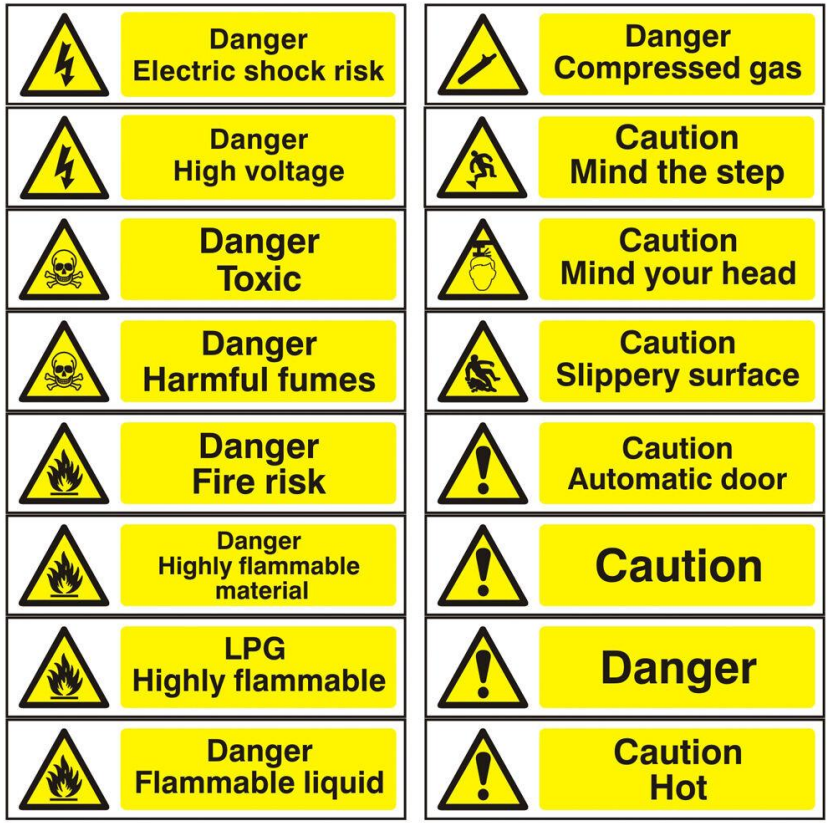
- A hazard is a dangerous phenomenon, substance, human activity or condition. It may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
- Anything that may cause harm (e.g. chemicals, electricity, working at height, etc.).
- Hazard is any source of potential damage, harm or adverse effects.
  - Hazard = any source of potential adverse health effect, harm or damage.
  - Risk = the likelihood that a person exposed to a hazard will be harmed.
  - Exposure = the extent to which someone is subjected to a hazard.

HAZARD + EXPOSURE = RISK

SAFETY SIGN


Safety signs for the undergraduates in the lab
Preferably don't touch anything in the lab
Nobody listens to you - they all wear selective ear protection
Listen carefully to the lab gossip about the boss
If it says nasty things about him then run away until you can
Never laugh about the boss' or postdocs' funny outfits
Don't let anyone treat you as a slave...
However, be humble and compliant with everyone
Don't behave like an alien in the lab
Don't hope to leave the lab early in the evening
But never give it up, psychological terror cannot break you
copyright Stripped Women in Science

SAFETY SIGN

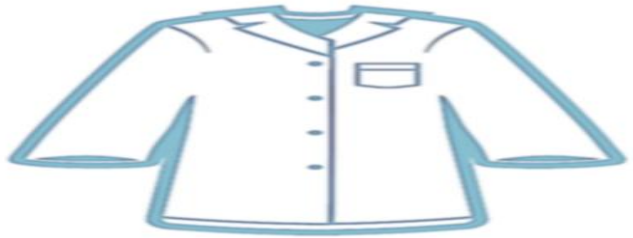

Danger
Electric shock risk
Danger
Compressed gas
Danger
High voltage
Caution
Mind the step
Danger
Toxic
Caution
Mind your head
Danger
Harmful fumes
Caution
Slippery surface
Danger
Fire risk
Caution
Automatic door
Danger
Highly flammable
material
Caution
LPG
Highly flammable
Danger
Danger
Flammable liquid
Caution
Hot

PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Personal protective equipment is used in the laboratory to protect ourselves when working with chemical hazards.
- Examples : laboratory coats, footwear, gloves, safety goggles and mask.

LABORATORY COATS

- The primary purpose of coats is used in the laboratory to protect against splashes and spills.
- In the laboratory coats should be nonfarmable and easily removable. Laboratory coats should be buttoned when in use.
- The rubber coated aprons can be worn to protect against chemical splashes and may be worn over a laboratory coat for additional protection.
- We should not be wear laboratory coats, gloves, or any other personal protective clothing outside of laboratory areas.



FOOTWEAR

- Shoes must be worn in the laboratory at all times, regardless of the performance experimental works and use leather shoes which is completely protects the toes, heel and top of foot provide the best general protection.
- The shoes must be water proof materials used.
- The shoes must have a nonslip sole firmly attached to the foot and sandals, sneakers and open-toed shoes.
- Do not provide adequate protection when handling heavy objects that might fall onto the fee.

GLOVES

- Gloves are required for routine laboratory practicals to protect the hands when the handling chemical, physical, or biological hazards that can enters in to the body through the skin and it is important to wear the proper protective gloves.
- Gloves is made up of polyvinyl or other nonlatex gloves are an acceptable alternative for people with latex allergies.
- Certain gloves materials better protection against particular reagent and hazards chemical.
- Nitrile gloves, offer a wider range of compatibility with organic solvents than do latex glove

EYE WEAR

- Laboratory Safety goggles is the best protection against hazards chemical splashes, mists, vapors and dusts.
- Eye wear is required to be worn at any time projectile objects are being used in the laboratory works.
- Contact lenses do not offer eye protection; it is strongly recommended that they are not be worn in the laboratory experimental works.
- If using contact lenses instead of glasses, then we should wear eye-cup safety goggles in the laboratory.
- We should wear ultraviolet absorbing protective safety glasses while working with ultraviolet light.

MASK

- The face masks is a partial cover for the face used for protection.
- It provides protective covering for nose and mouth.
- Face masks generally used in biomedical research laboratories are called dust masks.
- These masks are the white disposable kind with two elastic bands, one that goes to above the ears and the other below the ears.
- The dust masks block most of large airborne particles.
- They are often used when weighing out powders and during any occupational works.
- There are many different kinds of dust masks; therefore, know the limitation of the protection and wear the proper mask suitable for the job

RESPIRATORS

- Respirators filter contaminants, either small airborne particles or chemicals including gases.
- Respirators must be regularly cleaned, sanitized and maintained.

HANDLING GLASSWARE

- Breakage of glassware is the common cause of injuries in laboratories works.
- Clean all glassware before using laboratory experimental works.
- Protect hands with latex gloves.
- Tests may lead to erroneous result if dirty glassware is used.
- Use glassware's should be washed with water.
- Special cleaning solutions such as chromic acid solutions are suggested in the case of more dirty glassware's.
- Glassware's should also be soaked in acidic water for cleaning purpose (1% HCL solution or Nitric Acid) before use.
- Commonly used glassware beaker, test tube, conical flask, volumetric flask, measuring cylinder, pipette, reagent bottles etc.

- Mouth pipetting is never be allowed, using only rubber teat (Bulb) or used automated micropipette.
- Chemical Safety :- Never touch, taste or smell of chemical unless instructed to do so.
- Pencils, pen or any other materials should never be placed in your mouth.
- Don't eat food / drink water in the laboratory. Never use glassware as food / water containers.
- Hair :- Hair must be tied back.

- **Work space :**

  Work space must be kept neat at all times and before leaving the laboratory all equipment and apparatus must be returned to there shelf.

- **Waste disposals :-**

  After completion of laboratory experiment unwanted material must be discarded in designated containers.

OCCUPATIONAL SAFETY AND HEALTH ACT

- OSHA regulations require that each laboratory develop, implement, and adhere to the plan that ensures the protection of laboratory staff against potential exposure to specimen pathogens and ensure that the medical wastes produced by the laboratory are managed and handled in a safe and effective manner.
- Each laboratory employee must be placed in to one of the following three groups.

Group I:

All employees have occupational exposure to blood or other potentially infectious material.

Group II:

Some employees have occupational exposure to blood or other potentially infectious material

Group III:

Employees do not have any occupational exposure to blood or other potentially infectious material.

Group I and II employees must receive training on the OSHA bloodborne standard before participation in the laboratory work. These employees must be offered vaccination for hepatitis B within 10 working days of initial assignment to a working position in the laboratory

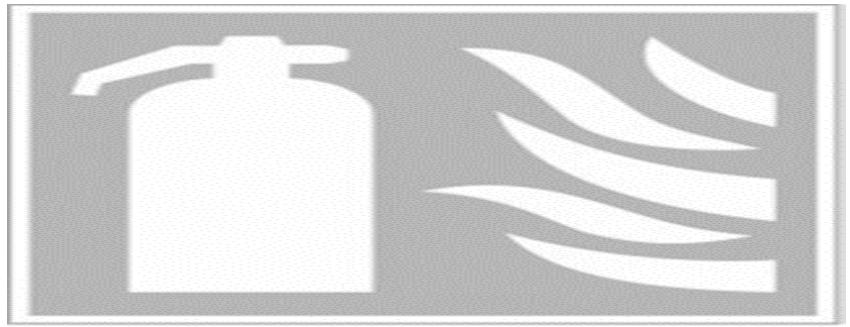
ELECTRICAL

- Electrical hazards are common caused by faulty operation and improper maintenance of electrical equipment's.
- Results in the minor burns to severe injuries that may be lead to death.
- General precautions to prevent electrical hazard in a laboratory areas are;

1. In the Laboratory all electrical equipment shall be properly grounded.
2. Overload circuits should be avoided, Never be used extension cord.
3. Electrical equipment should not be touch with wet hands.
4. Do not disable laboratory any electrical safety features.
5. Repair should be done by authorized persons.
6. Do not leave equipment switched on when not in use.

PRECAUTIONS REGARDING FIRE AND EXPLOSIONS

- Open flames should not be left unattended.
- Leakages of gas from gas cylinder or from the gas taps should be promptly reported to the superior.
- Smoking should be strictly prohibited in the laboratory.
- Burning matchsticks should not be thrown in the waste basket.
- The laboratory worker should know the location of following requirements-
  - i) A charged fire extinguisher,
  - ii) Bucket of sand with scoop
  - iii) Fire blankets



CHEMICALS AND RADIOACTIVE SUBSTANCES

- All chemicals should be correctly labeled with names and warnings
- Chemical hazard warning charts should be displayed prominently.
- Staff should be trained to deal with spillages.
- Bottle carriers should be used appropriately.
- Proper record should be maintained of stocks and of radioactive substances

FIRST AID BOX IN LABORATORY

Contact with corrosive chemicals and reagents:

- Acid splashes on the skin
  - Wash the affected skin with plenty of tap water. Bathe skin with cotton wool soaked in 5% solution of sodium carbonate.
  - Rinse the affected skin in mild detergent and then contact a physician.
- Alkali splashes on the skin
  - Wash the affected skin with plenty of tap water. Bathe the skin with cotton wool soaked in 5% acetic acid.
  - Seek the medical help.

- Contact with phenol
  - Wash the affected skin with large volumes of tap water.
  - Use of polyethylene glycol (PEG) mixed with water for further irrigation of affected skin.
  - Consult a physician.

EYE ACCIDENTS

Burns of the eye by alkali or acid are among the most urgent ocular emergencies. Alkali burns are more disastrous than those of acid burns.

- Acid or Alkali splashes in the eyes
  - Immediately wash the eyes with plenty of tap water by holding apart the eyelids manually.
  - Rinse the eyes in sterile saline.
  - Consult an ophthalmologist immediately.

EYE WASH STATION

- All laboratory using hazardous chemicals, particularly corrosive chemicals.
- It must be required eyewash station in the laboratory work area.
- Eye wash stations it must be required mirror and a set of bottles containing saline solution that can be used to flood the injured eye with water.
- The eye wash station is intended to allow us to flood the eye with a continuous stream of water

ACCIDENTAL SWALLOWING OF POISONOUS REAGENT

- Spit out immediately.
- Rinse the mouth promptly with tap water and then induce vomiting by drinking warm salt water (one tablespoon of common salt in glassful of warm water).

ACCIDENTAL SWALLOWING OF INFECTIOUS SPECIMEN

- Spit it out immediately.
- Wash the mouth with dilute antiseptic lotion.
- Rinse the mouth thoroughly with tap water

ACCIDENTAL SWALLOWING OF CORROSIVE REAGENTS

- **Acids:**
  - Promptly rinse the mouth with tap water.
  - Antidote such as 5% soap solution, 8% magnesium hydroxide or white of egg mixed with about 500 ml of water, can be used orally to neutralize the acid.
  - Seek medical help immediately.
- **Alkalis:**
  - After rinsing the mouth with tap water, anti-dote such as lemon juice or 5% acetic acid can be taken orally to neutralize the alkalies.
  - Seek medical help immediately.

CONTACT OF LIP AND TONGUE WITH CORROSIVE REAGENTS

- **Acids**
  - immediately rinse with tap water.
  - Bathe the affected part in 2% aqueous sodium carbonate.
- **Alkalies**
  - Immediately rinse in tap water.
  - Bathe the affected part in 5% acetic

INJURIES CAUSED BY BROKEN GLASS

- Wash the wound immediately with a disinfectant solution (diluted Dettol).
- Cover with gauze and adhesive tape.

BLEEDING

- Make the patient to lie down.
- Try to stop bleeding by applying direct pressure to the wound with a sterilized pad and by means of a firm bandage.
- Clean the affected area by using an antiseptic such as tincture iodine and apply sterile gauze and bandage.

BURNS AND MANAGEMENT

- Minor burns
  - Immediately bathe the affected area in cold water.
  - Cover the burnt area with sterile dressing as early as possible.
  - Seek medical help
- Severe burns
  - If the victim is on fire, put out the fire by using any material such as sheets, towels of coats.
  - Pour cold water on the affected area.
  - Remove smoldering cloths as quickly as possible.
  - Call a physician immediately.

GOOD LABORATORY PRACTICES

- Cleanliness is essential for biochemical experiment. Work area must be clean. Make sure that all equipment's and labware it must be clean before use. Clean the working area equipment and lab ware after use.
- Laboratory work area must be free from unwanted reagent.
- Proper storage of chemicals must be done.
- All the reagents must be neatly labeled. Do not contaminate reagents by using used / dirty pipettes for taking the reagent.
- Do not contaminate chemicals by using used / dirty spatulas (in case of solids) for taking out the chemical

- Do not contaminate stoppers of reagent bottles and put the stoppers of bottle immediately after using reagents.
- Returns the reagent bottles to there respective shelf immediately after use so as to avoid accidental breaking of bottles on the working bench.
- Throw solids in the waste bins if it is necessary to pour strong acid or alkali into the sink, run water freely to wash it away.
- All equipment's should be handled with extreme care and learn the correct operating procedure for each instrument before using it keep the instrument in working order after its use.
- Fire extinguishers and first aid box must be available in the laboratory.
- All glassware must be sterilized to prevent infections

SCHOOL OF HEALTH SCIENCES
CLINICAL BIOCHEMISTRY LAB

Do's	Don'ts
• Do wear apron. • Do wear gloves. • Do wear eye protection. • Do handle glassware safely. • Do practice fire safety. • Do wear closed toed shoes. • Do practice electrical safety. • Do keep reagents and other things on the proper place after the completion of experiment. • Do keep notes. • Do Keep point sharp objects tools away from yourself and others. • Do thoroughly clean your lab workspace at the end of the lab session. • Do wash used glassware/plasticware and your hands thoroughly with soap or other cleaning agents.	• Don't eat or drink in the lab. • Don't use excessive force on equipments, glasswares or plasticwares. • Don't leave a mess. • Don't engage in practical jokes or boisterous conduct in the lab. • Don't left chemicals/reagents on lab work space after completion of the experiment.

DO'S

DON'TS

THANK YOU