Department of Chemistry, PDUAM, Dalgaon
Chemical Waste Disposal Guidelines

1. Segregation of waste → **2. Labeling** → **3. Storage of waste in different containers** → **4. Disposal with proper treatment**

Aqueous Waste (< 40% organic chemicals)

1. Container 1: Acids
2. Container 2: Base
3. Container 3: Mixture of non hazardous chemicals

Organic Waste (> 40% organic chemicals)

1. Container4:Non-halogenated
2. Container 5: Halogenated
3. Container 6: Unidentified mixture of solvents

Solid Waste

1. Container 7: Heavy metal salts
2. Container 8: Hazardous mixture of organic compounds

Miscellaneous:

Slightly contaminated (pipes, plastic syringes, sample bags, sample caps, gloves *etc*.)

- ❖ Broken glass wares are collected in a box for recycling/disposal.
- ❖ Organic /inorganic compounds synthesized in laboratory are stored safely for reuse.
- ❖ Acids/Bases are properly neutralized prior draining off.

DEPARTMENT OF CHEMISTRY, PDUAM, DALGAON

SAFETY RULE ON CHEMICAL USES AND WASTE MANAGEMENT

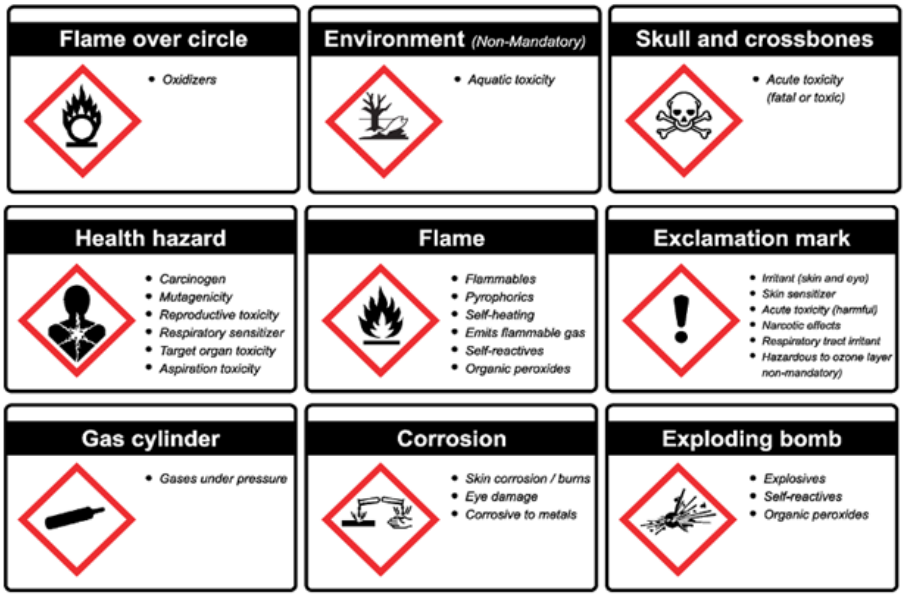
INTRODUCTION

Effective chemical management is essential for safeguarding the well-being of our department, surrounding communities, and the environment. The utilization and disposal of chemicals must be conducted in a manner that prevents harm to nature. This poses a significant challenge in the field of chemistry education. It requires us to employ the necessary measures to use the appropriate quantities of chemicals, regenerate organic solvents after use, design reactions on a minimal scale, and minimize waste generation in our chemical laboratories. By adhering to these principles, we can actively contribute to maintaining a clean and environmentally-friendly setting through the practice of green chemistry.

Chemical waste is basically a broad term and encompasses many types of materials. Material Safety Data Sheet (MSDS) helps in identification and provides all the information of the chemical wastes that needs special disposal protocol. Examples of chemical waste include, but are not limited to unused and surplus reagent chemicals, by-products etc. To reduce its long-term liability, the Department of Chemistry is proactive in managing all of its chemical waste in an environmentally sound manner.

Hazardous Wastes and the GHS sign:

A hazardous waste that displays a "Hazardous Characteristic" are not listed specifically by their chemical name but they are regulated as hazardous wastes because they exhibit one or more hazardous characteristics. Some of the characteristics and their GHS (Globally Harmonized System) pictogram are shown below:



Chemical Safety: General precautions

- ✓ Students are briefed on the possible dangers associated with chemicals by the laboratory prior to commencing work.
- ✓ Safety material data sheets displaying product-specific handling, storage, and disposal information are prominently displayed in the lab.
- ✓ Students are required to wear appropriate laboratory coats and shoes when conducting practical experiments in the laboratory.
- ✓ Concentrated acids are kept separately at the corner of the lab.
- ✓ Flammable organic solvents are kept away from burners.
- ✓ A fully equipped first aid box is easily accessible in the laboratory.

Waste Minimization:

The department aims to minimize the waste generation, following practices are mentioned below:

- Record of chemicals (listing name, date of expiry, available quantity) in the laboratory,
- Ordering the smallest quantity of chemical materials required,
- Substitute hazardous chemicals with non-hazardous chemicals whenever possible,
- Sharing surplus chemical with other department if required.

Procedure for managing hazardous chemical waste materials:

- Appropriate containers for the storage of waste materials.
- Properly label all waste containers.
- Keeping waste containers closed.
- Store chemical waste.

COLLECTION OF WASTE AND DISPOSAL

All chemical wastes are segregated at the source into compatible containers and labelled properly.

Organic solvents

- ✓ Halogenated solvent,
- ✓ Non-halogenated solvent,
- ✓ Unidentified Mixtures of solvents.

Table 1: *Common organic solvents used in the laboratory*

S.l. No	Solvent	Boiling point /°C	Category
1.	Diethyl ether	35-36	Non-Halogenated
2.	Dichloromethane	40	Halogenated
3.	Acetone	56	Non-Halogenated
4.	Chloroform	61	Halogenated
5.	Methanol	64.7	Non-Halogenated
6.	Hexane	68-70	Non-Halogenated
7.	Toluene	110.6	Non-Halogenated
8.	Petroleum ether	40-60 & 60-80	Non-Halogenated
9.	Ethyl acetate	77.5	Non-Halogenated
10.	Ethanol	78	Non-Halogenated

- ❖ *Flammable solvent (such as acetone, toluene, diethyl ether, alcohols etc.) should be stored separately*

Aqueous waste

- ✓ Acidic waste pH< 4,
- ✓ Basic waste pH > 10 ,
- ✓ Safe soluble inorganic salt.

Solid waste

- ✓ Broken glassware are collected in box for recycling/disposal,
- ✓ Organic /inorganic compound synthesized in laboratory stored safely for reuse,
- ✓ Miscellaneous solid waste (hand gloves, pipes, reagent bottles, paper, packing materials, filter paper, plastic container, *etc*).

CHEMICAL WASTE TREATMENT

The measures for treatment of different categories of waste have been described below;

- ✓ The heavy metal based compounds are properly treated in the laboratory (*e.g*. lead nitrate is treated with dilute HCl so that lead precipitates as lead chloride which is filtered and the lead chloride is collected as solid waste).
- ✓ Aqueous acid waste is completely neutralized prior to draining off.
- ✓ Aqueous basic waste is completely neutralized prior to draining off.
- ✓ The compounds prepared as a part of preparation are stored and later used for analysis of functional groups, cations and anions. This helps minimise the solid waste.
- ✓ Carcinogenic organic solvents (benzene, carbon tetrachloride *etc*.) kept in separate containers using proper safety measure.