Safety issues 4

Chemical safety

Key Elements:

1. **Knowledge of hazards**
2. **Personal practices**
3. **Using chemicals**
4. **Control of hazards**
5. **Storage of chemicals**

KNOWLEDGE OF HAZARDS

- **Know the hazards** associated with the materials you are using.
- **Review labels**.
- Know **emergency procedures**
- Know the **locations of safety equipment** such as emergency shower, eyewash, fire extinguisher, fire alarm, and emergency phone numbers.

PERSONAL PRACTICES

- **Avoid working alone** in the laboratory.
- **Do not eat, drink, smoke, chew gum, or apply cosmetics, lip salve, contact lenses** in areas where laboratory chemicals are used or stored.
- **Do not store food items or cosmetics** in areas where laboratory chemicals are used or stored.
- **Confine long hair and loose clothing** when working with chemicals.

- Wear **shoes with closed toes** and closed heels.
- Wear **appropriate personal protection equipment** including lab coat, gloves and eye protection.
- **Do not smell or taste** chemicals.
- **Do not use mouth suction** for pipetting or starting a siphon.
- **Always wash hands and other exposed skin** after chemical use.

USING CHEMICALS

- **Date chemicals when received and when opened.**
- Ensure incoming chemicals are on the **inventory list.**
- For chemicals that degrade in quality or become unsafe after prolonged storage, also date them with the **shelf-life expiration date.**
- Always **read the label carefully.**

- Ensure that all required **safety equipment is available and in good working order**, including materials and equipment for spill response.

- **Conduct a visual inspection** of the container and its contents routinely.

- Ensure that all containers are in **good condition and properly labeled.**

Indications for disposal of the contents include:

- **cloudiness** in liquids
- material **changing colour**
- **leakage**
- **pressure build-up** within the bottle

-- **Never force open or bang** a chemical container.

-- Keep **work areas clean and uncluttered**, with chemicals.

CONTROL OF HAZARDS

- Use **appropriate personal protective equipment**.
- Conduct all processes that may result in the release of toxic vapors, fumes or dust **within the fume hood** or other adequate containment device.
- Do not leave potentially hazardous chemical processes **unattended.**

- **Handle and store laboratory glassware with care** to avoid damage and dispose of any damaged glassware in an appropriate sharps container.

- **Always rinse used glassware and plastic ware** after use and before giving to wash-up staff or placing in garbage.

- Wear **appropriate respiratory equipment** when air contaminant concentrations cannot be sufficiently restricted by engineering controls.

STORAGE OF CHEMICALS

- Store all **hazardous chemicals** in a **secure location**, accessible only to authorized laboratory workers.
- Store **large containers** of hazardous liquids securely **near floor but at a proper height.**
- **Minimize** quantities of chemicals kept in the work area.

Store chemicals **under appropriate conditions**:

- at **appropriate temperature and humidity** levels
- **away from heat sources** such as steam pipes or laboratory ovens
- **dry and adequately vented** storage locations
- **away from direct sunlight, electric motors**
- on shelves and in cabinets that are **secured to prevent toppling**

- **do not store** liquid chemicals **above eye level**

- use only explosion-proof refrigerators and freezers for storage of flammable liquids.

- **do not store unsegregated chemicals alphabetically.**

  Segregate chemicals by hazard class (e.g., flammable liquids, organic acids, oxidizers, reactive chemicals) and store separately.

CLASSIFICATION OF CHEMICALS ACCORDING TO SAFETY RISK

- **Class A Chemicals -** Compressed gas
- **Class B Chemicals -** Flammable and Combustible material
- **Class C Chemicals -** Oxidizing Material
- **Class D1 Chemicals** –Causing Immediate and Serious Toxic effects

  Class D2 Chemicals- Causing Other Toxic Effects

  Class D3 Chemicals- Biohazardous and Infectious Material
- **Class E Chemicals** – Corrosives
- **Class F Chemicals -** Dangerously Reactive Material

CLASS A CHEMICALS - COMPRESSED GAS

A compressed gas includes any product, material or substance contained under pressure greater than atmospheric pressure.

This includes gases **liquified by compression or refrigeration**.

- Compressed gases may represent many hazards depending on the type of gas , i.e. **toxic, flammable, corrosive, oxidizer** or **frostbite** in the case of cryogenic gases.

- **Compressed gas cylinders** may also pose a serious physical hazard if handled improperly. Dropped or damaged cylinders may **become missiles if they rupture** or valves are knocked off.

CLASS B CHEMICALS - COMBUSTIBLE AND FLAMMABLE MATERIAL

Flammables or combustibles are materials that under standard conditions can generate sufficient vapor to cause a fire in the presence of an ignition source.

Combustible and flammable materials include the following sub-divisions:

- **B1** Flammable gases
- **B2** Flammable liquids
- **B3** Combustible liquids
- **B4** Flammable solids
- **B5** Flammable aerosols
- **B6** Reactive flammable materials

- **Flammable liquids:**

  Materials which generate sufficient vapors to ignite at temperatures **below 100 °F (38 °C).**

- **Combustible liquids:**

  Materials which require temperatures **above 100 °F** to provide sufficient vapors for ignition.

CLASS C - OXIDIZING MATERIALS

Oxidizing materials include any compound that spontaneously evolves oxygen either at room temperature or under slight heating conditions.

- Oxidizing materials pose a serious fire and/or explosion risk **in the presence** of flammable or combustible materials.

- Many oxidizers may be highly **corrosive or toxic**.

General precautions for oxidizing materials in the lab:

- Keep **oxidizers away from combustible and flammable** materials.
- Store in **designated areas only**. Designated areas must be cool and dry.
- **Keep away from heat and sources of ignition.**
- Always wear **proper personal protective equipment**, including eye, face and hand protection.

Examples of strong oxidizers include:

- Chromic acid
- Potassium permanganate
- Hydrogen or benzoyl peroxide (any peroxide)
- Sodium perchlorate (any perchlorate)
- Nitric acid
- Sodium hypochlorite
- Percholoric acid
- Sulphuric acid

CLASS D: CHEMICALS, POISONOUS AND INFECTIOUS MATERIAL

Class D1 – Chemicals with immediate and serious toxic effects

- Chemicals which may cause acute toxic effects are classified as D1 materials.
- Such materials may be fatal or cause permanent damage if they are inhaled or ingested, or if they enter the body through skin contact.
- Less toxic substances should always be selected if an alternative is available.

Examples of D1 chemicals:

- Iodine
- Chloroform
- Methanol
- Crystal violet
- Ethanol
- Potassium hydroxide
- Hydrochloric acid

Class D2 – Chemicals with delayed and moderate toxic effects

- **Class D2 chemicals are materials that are not immediately dangerous to health**; however, repeated exposures may cause death or permanent damage over time.

- Many D2 chemicals will cause cancer, birth defects and sterility.

- Other D2 chemicals may be sensitizers, which produce a chemical allergy.

Examples of D2 chemicals:

- Hexane
- Sodium phosphate
- Petroleum spirit
- Isopropanol
- Trichloroacetic acid
- Acetone
- Sodium azide
- Boric acid
- Xylene
- Potassium ferrocyanide

Class D3 - Biohazardous and infectious material

Biohazardous and infectious materials are any organism, or its toxins, that has been shown to cause disease or is believed to cause disease in animals or humans.

Class E – Corrosives

Corrosives are materials which chemically react at the point of contact to cause visible (often burn-like) damage to tissue.

Examples of corrosives include **acids** and **bases**.

Class F Chemicals - Dangerously Reactive Chemicals

Dangerously reactive chemicals are materials that react rapidly with themselves or other materials to release relatively large amounts of energy.

- In some situations, the reaction may be violent enough to produce a detonation.

Examples

- ammonium perchlorate.
- azo and diazo compounds.
- acetylides.
- azides.
- fulminates.
- hydrogen peroxide solutions (91% by weight)
- many organic peroxides.
- nitro and nitroso compounds.


Thank You!