Standard Operating Procedure: COMPATIBLE CHEMICAL STORAGE

**LM- applicable Policies:**

1) NO chemical waste is allowed to be stored on the floor.
2) Peroxidizable compounds should be ordered in quantities no larger than a 6 months supply. The opening date “must” be recorded. Stocks must be disposed of at the 6 months period from opening date (1 year if containing inhibitors)
3) It is mandatory for each laboratory at LM to have an updated inventory of hazardous chemicals together with the associated SDSs. This information must be available to every person working at LM.
4) All chemicals (stocks and working dilutions, solutions) must follow WHMIS 2015 labels

1. **Purpose:** to provide step by step guidance on how to compatibly store hazardous chemicals.

2. **Scope:** applies to all students, staff and faculty utilizing lab spaces.

3. **Prerequisites:** WHMIS and Chemical Safety training. Reference the chemical storage flow chart available in Appendix A.

4. **Responsibilities:** it is the responsibility of all lab users to ensure that chemicals are stored in the manner that is described in SDS. Lab users must be aware of different storage locations and requirements for using those locations safely.

5. **Types of Storage**
5. **Procedure:**

- Know the hazards! Consult the SDS to obtain the physical and chemical properties of your chemical
- Identify the primary and secondary hazard class and determine the appropriate storage group. Store chemicals compatibly according to hazard groups; flammable, corrosive, oxidant etc.
- Some items will fit into 2 or more classes requiring further segregation. (Ex – caustic solution that is also an oxidant would need to be separated from other caustics).
- Chemicals should be stored on shelves with a small lip to help prevent bottles from falling or being knocked off.
- Use the following Guideline supplied by EHS to compatibly store chemicals in your lab.

**Chemical Storage Guidelines: General Storage Requirements:**

<table>
<thead>
<tr>
<th>Chemical Type</th>
<th>WHMIS Class</th>
<th>Examples</th>
<th>Storage Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids – Flash Point &lt;37.4°C</td>
<td>B2</td>
<td>• Toluene</td>
<td>• Keep in a sealed or metal pipe ventilated, Fire Code approved, flammable storage cabinet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethanol</td>
<td>• Keep away from oxidizing materials and acids/bases.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Carbon Disulphide (CS2)</td>
<td></td>
</tr>
<tr>
<td>Combustible liquids – Flash Point &gt;37.4°C</td>
<td>B3</td>
<td>• Mineral spirits</td>
<td>• Recommended to be stored in the same way as flammables.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethylene glycol monobutyl ether (EB)</td>
<td></td>
</tr>
<tr>
<td>Caustic Solids</td>
<td>E</td>
<td>• Potassium hydroxide</td>
<td>• Dry cabinet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sodium hydroxide</td>
<td>• Away from acids</td>
</tr>
<tr>
<td>Basic/caustic Solutions</td>
<td>E</td>
<td>• Sodium hydroxide/water</td>
<td>• Cabinet with separate drip pan from acids etc.</td>
</tr>
</tbody>
</table>
| Inorganic Acids                                      | E  | • Nitric acid  
|                                                  |    | • Phosphoric acid  
|                                                  |    | • Sulfuric acid  
|                                                  |    | • Hydrofluoric acid (HF(aq))  
|                                                  |    | • Store in cabinet of non-combustible material – dedicated acid storage recommended  
|                                                  |    | • Use plastic secondary containment to contain spills  
|                                                  |    | • Separate acids into groups - mineral acids, oxidizing acids, special acids (e.g. perc, HF)  
|                                                  |    | • Separate Perchloric acid from all other acids using non-reactive bins such as glass or equivalent  
|                                                  |    | • Keep separate from caustic solids and solutions  
|                                                  |    | • HF - see HF protocol  
| Organic Acids                                      | E, various | • Glacial acetic acid  
|                                                  |    | • On shelf in secondary containment, separate from other groups.  
| Odourous volatile substances                      | various | • Perchloroethylene  
|                                                  |    | • Mercaptans  
|                                                  |    | • Can be stored with flammable liquids to reduce odours  
| Water Reactives                                   | F  | • Sodium  
|                                                  |    | • Potassium  
|                                                  |    | • In cabinet, typically under inert blanket.  
|                                                  |    | • Cabinet should withstand water spray in case of fire requiring water suppression  
| Air Reactives                                     | F  | • T-butyl lithium  
|                                                  |    | • Lithium aluminum hydride  
|                                                  |    | • Store in inert atmosphere away from all other groups.  
|                                                  |    | • Follow supplier’s specific storage instructions  

### Oxidizers

| C | • Sodium hypochlorite  
• Benzoyl peroxide  
• Potassium permanganate | • Store in cabinet of non-combustible material  
• Separate from flammable and combustible materials |

### Reducing agents

| C | • Oxalic acid  
• Sodium borohydride  
• Tin II chloride  
• Phosphorous acid | • Store away from oxidizers and flammables/combustibles in non-combustible cabinet |

### Toxic Gasses

| D1A | • Hydrogen sulphide  
• Phosgene  
• Sulphur dioxide  
• Arsine | • Dedicated ventilated cabinet if concentration is sufficient.  
• Example – 25ppm CO in N2 does not need ventilated cabinet. |

### Inert Solids

| various | • Sodium Chloride  
• KNO3 | • Shelving/cabinets with edge guards |

### 6. Other

- You may also use the EHS chemical storage flow chart to assist in choosing the correct storage for chemicals in the lab.


Prepared by Alexandra Morrissey (Supervisor, Chemical Stores)  
Reviewed by Grace Flock (Director of Operations and Technical Services)
APPENDIX 1: Chemical Storage Flowchart

Explosive or shock sensitive
- Explosive or shock sensitive
  → Secure / limit access to product - follow Explosives Regulations
 NO
  → Product covered by Explosives Regs e.g. black powder
  YES

Highly reactive e.g. t-butyl lithium, lithium aluminium hydride, metallic sodium
- Highly reactive
  → Limit access to product - Segregate from incompatible chemicals
  NO
  → Water reactive
  - Water reactive
    → Store in a specific cabinet away from sprinkler and potential source of water - segregate Reducers and Oxidizers in different secondary containers
    NO
    → Air sensitive / pyrophoric
    - Air sensitive / pyrophoric
      → Store under nitrogen and refer to SDS requirements
      NO
      → Reducer
      - Reducer
        → Segregate from Reducing agents, use secondary containers
        NO
        → Oxidizer
        - Oxidizer
          → Segregate from Oxidizing agents, use secondary containers
          NO
          → Inert - store in ventilated areas (e.g. normal lab ventilation)
          YES

Gas
- Gas
  → Inert - store in ventilated areas (e.g. normal lab ventilation)
  NO
  → Flammable solid
  - Flammable solid
    → Store in a specific cabinet away from sunlight and potential source of heat
    NO
    → Organic
    - Organic
      → Store in a specific cabinet away from sunlight and potential source of heat
      NO
      → Flammable / combustible liquid
      - Flammable / combustible liquid
        → Store in flammable storage cabinet
        NO
        → Non hazardous product
        - Non hazardous product
          → Stored in open shelving
          NO
          → Not combustible
          YES

Corrosive
- Corrosive
  → Store in corrosive cabinet for acids - segregate from organic acids and reducing agents
  NO
  → Acid
  - Acid
    → Store in corrosive cabinet for acids
    NO
    → Organic
    - Organic
      → Store in flammable storage cabinet
      NO
      → Flammable / combustible liquid
      - Flammable / combustible liquid
        → Store in corrosive cabinet - segregate from oxidizers
        NO
        → Flammable solid
        - Flammable solid
          → Store in corrosive cabinet for acids
          NO
          → Non hazardous product
          - Non hazardous product
            → Stored in open shelving
            NO
            → Not combustible
            YES

Volatile
- Volatile
  → Store in ventilated or closed cabinet
  NO
  → Not volatile
  YES

Note:
WHMIS pictograms do not provide all information for storage. Refer to Section 7 of SDS for the necessary information for storage compatibility.

June, 2017

WHMIS 2015
- Explosive
  - Explosive
    → Explosive
    - Explosive
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 Adam: This section provides a detailed flowchart for chemical storage based on WHMIS 2015 regulations. It outlines different categories of hazardous chemicals and the corresponding storage requirements to ensure safety. The flowchart visually represents the decision-making process for segregating chemicals based on their properties such as flammability, reactivity, corrosivity, and toxicity. Each node represents a decision point, leading to specific storage instructions.