 <b>Chemistry</b> UNIVERSITY OF TORONTO	<b>The Department of          Chemistry          Lash Miller</b>	<b>SOP #</b>	AR-1
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<b>SOP Owner</b>	Alexandra Morrissey	<b>Approval</b>	Grace Flock

## 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.

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

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

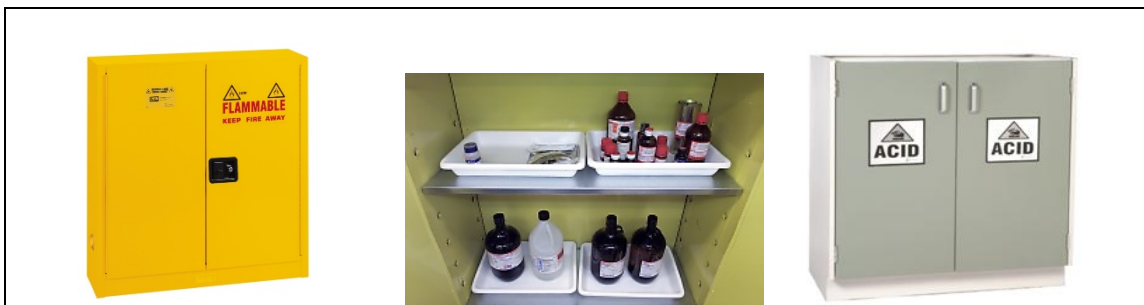
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4. **Responsibilities:** it is the responsibility of all lab users to ensure that chemicals are stored in the manner that is described in SDS. Lab users must be aware of different storage locations and requirements for using those locations safely.

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5.

<b>Types of Storage</b>
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**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:

Chemical Type	WHMIS Class	Examples	Storage Recommendations
<b>Flammable liquids – Flash Point &lt;37.4°C</b>	B2	<ul style="list-style-type: none"> <li>• Toluene</li> <li>• Ethanol</li> <li>• Carbon Disulphide (CS<sub>2</sub>)</li> </ul>	<ul style="list-style-type: none"> <li>• Keep in a sealed or metal pipe ventilated, Fire Code approved, flammable storage cabinet</li> <li>• Keep away from oxidizing materials and acids/bases.</li> </ul>
<b>Combustible liquids – Flash Point &gt;37.4°C</b>	B3	<ul style="list-style-type: none"> <li>• Mineral spirits</li> <li>• Ethylene glycol monobutyl ether (EB)</li> </ul>	<ul style="list-style-type: none"> <li>• Recommended to be stored in the same way as flammables.</li> </ul>
<b>Caustic Solids</b>	E	<ul style="list-style-type: none"> <li>• Potassium hydroxide</li> <li>• Sodium hydroxide</li> </ul>	<ul style="list-style-type: none"> <li>• Dry cabinet</li> <li>• Away from acids</li> </ul>
<b>Basic/caustic Solutions</b>	E	<ul style="list-style-type: none"> <li>• Sodium hydroxide/water</li> </ul>	<ul style="list-style-type: none"> <li>• Cabinet with separate drip pan from acids etc.</li> </ul>

<b>Inorganic Acids</b>	E	<ul style="list-style-type: none"> <li>• Nitric acid</li> <li>• Phosphoric acid</li> <li>• Sulfuric acid</li> <li>• Hydrofluoric acid (HF(aq))</li> </ul>	<ul style="list-style-type: none"> <li>• Store in cabinet of non-combustible material – dedicated acid storage recommended</li> <li>• Use plastic secondary containment to contain spills</li> <li>• Separate acids into groups - mineral acids, oxidizing acids, special acids (e.g. perc, HF)</li> <li>• Separate Perchloric acid from all other acids using non-reactive bins such as glass or equivalent</li> <li>• Keep separate from caustic solids and solutions</li> <li>• HF - see HF protocol</li> </ul>
<b>Organic Acids</b>	E, various	<ul style="list-style-type: none"> <li>• Glacial acetic acid</li> </ul>	<ul style="list-style-type: none"> <li>• On shelf in secondary containment, separate from other groups.</li> </ul>
<b>Odorous volatile substances</b>	various	<ul style="list-style-type: none"> <li>• Perchloro-ethylene</li> <li>• Mercaptans</li> </ul>	<ul style="list-style-type: none"> <li>• Can be stored with flammable liquids to reduce odours</li> </ul>
<b>Water Reactives</b>	F	<ul style="list-style-type: none"> <li>• Sodium</li> <li>• Potassium</li> </ul>	<ul style="list-style-type: none"> <li>• In cabinet, typically under inert blanket.</li> <li>• Cabinet should withstand water spray in case of fire requiring water suppression</li> </ul>
<b>Air Reactives</b>	F	<ul style="list-style-type: none"> <li>• T-butyl lithium</li> <li>• Lithium aluminum hydride</li> </ul>	<ul style="list-style-type: none"> <li>• Store in inert atmosphere away from all other groups.</li> <li>• Follow supplier's specific storage instructions</li> </ul>

<b>Oxidizers</b>	C	<ul style="list-style-type: none"> <li>• Sodium hypochlorite</li> <li>• Benzoyl peroxide</li> <li>• Potassium permanganate</li> </ul>	<ul style="list-style-type: none"> <li>• Store in cabinet of non-combustible material</li> <li>• Separate from flammable and combustible materials</li> </ul>
<b>Reducing agents</b>	C	<ul style="list-style-type: none"> <li>• Oxalic acid</li> <li>• Sodium borohydride</li> <li>• Tin II chloride</li> <li>• Phosphorous acid</li> </ul>	<ul style="list-style-type: none"> <li>• Store away from oxidizers and flammables/combustibles in non-combustible cabinet</li> </ul>
<b>Toxic Gasses</b>	D1A	<ul style="list-style-type: none"> <li>• Hydrogen sulphide</li> <li>• Phosgene</li> <li>• Sulphur dioxide</li> <li>• Arsine</li> </ul>	<ul style="list-style-type: none"> <li>• Dedicated ventilated cabinet if concentration is sufficient.</li> <li>• Example – 25ppm CO in N2 does not need ventilated cabinet.</li> </ul>
<b>Inert Solids</b>	various	<ul style="list-style-type: none"> <li>• Sodium Chloride</li> <li>• KNO3</li> </ul>	<ul style="list-style-type: none"> <li>• Shelving/cabinets with edge guards</li> </ul>

## ***6. Other***

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

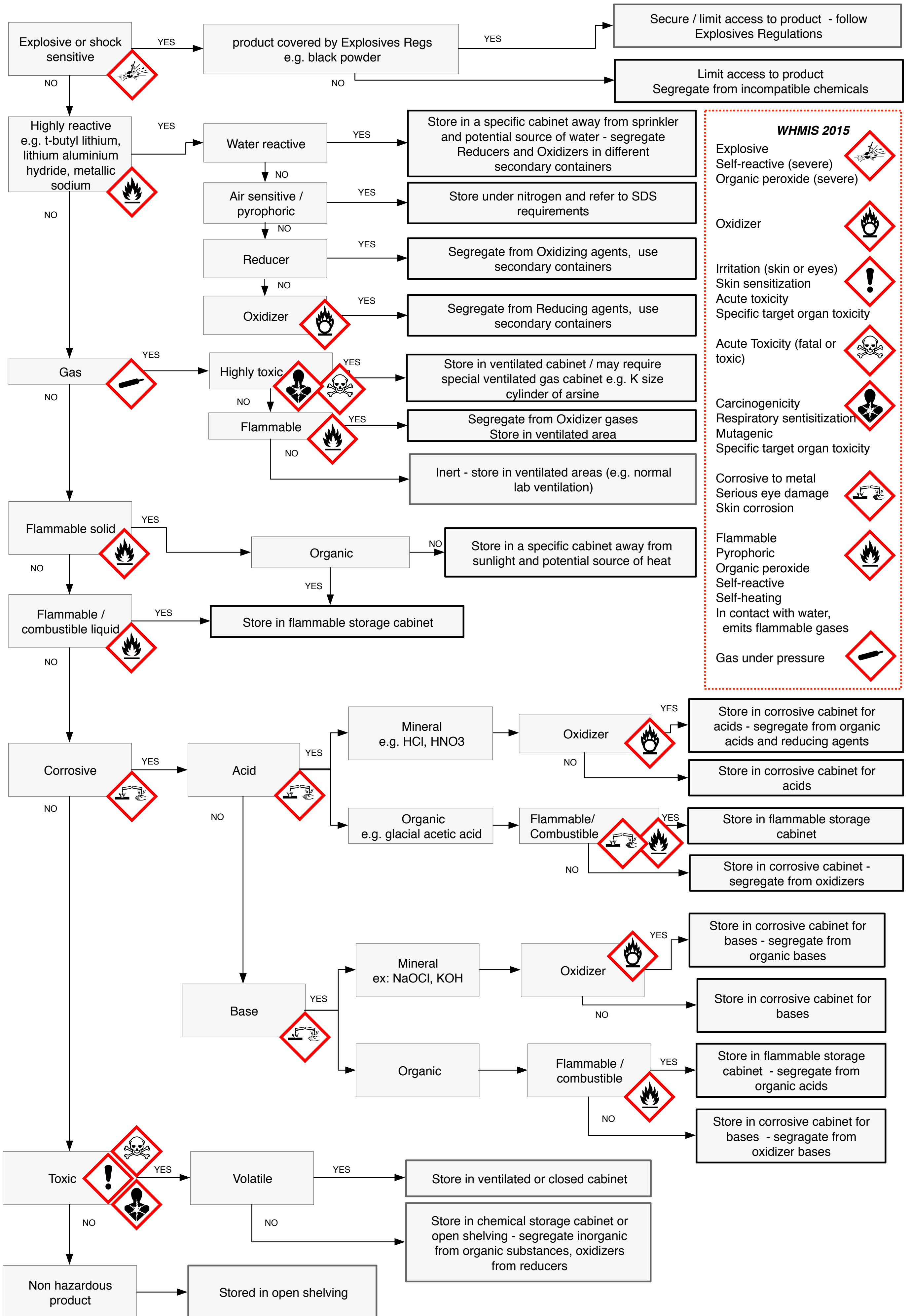
<https://ehs.utoronto.ca/wp-content/uploads/2014/06/Chemical-Storage-Flowchart.pdf>

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Reviewed by Grace Flock (Director of Operations and Technical Services)

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# APPENDIX 1: Chemical Storage Flowchart



**WHMIS 2015**

- Explosive (Explosive pictogram)
- Self-reactive (severe) (Flame pictogram)
- Organic peroxide (severe) (Flame pictogram)
- Oxidizer (Oxidizer pictogram)
- Irritation (skin or eyes) (Irritation pictogram)
- Skin sensitization (Irritation pictogram)
- Acute toxicity (Acute toxicity pictogram)
- Specific target organ toxicity (Acute toxicity pictogram)
- Acute Toxicity (fatal or toxic) (Skull and crossbones pictogram)
- Carcinogenicity (Skull and crossbones pictogram)
- Respiratory sensitization (Skull and crossbones pictogram)
- Mutagenic (Skull and crossbones pictogram)
- Specific target organ toxicity (Skull and crossbones pictogram)
- Corrosive to metal (Corrosion pictogram)
- Serious eye damage (Corrosion pictogram)
- Skin corrosion (Corrosion pictogram)
- Flammable (Flame pictogram)
- Pyrophoric (Flame pictogram)
- Organic peroxide (Flame pictogram)
- Self-reactive (Flame pictogram)
- Self-heating (Flame pictogram)
- In contact with water, emits flammable gases (Flame pictogram)
- Gas under pressure (Gas pictogram)

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