

Storage of chemicals in the laboratory

Introduction

Chemicals are supplied to SGUL in a variety of forms e.g. liquids, pellets and powders. The hazards associated with a chemical may not always be obvious. [Ethanol](#) and Xylene are obviously known to be flammable liquids. [Sodium Dodecyl Sulphate](#) which is sometimes used in electrophoretic running buffer can be a flammable powder under some circumstances as well as being an irritant and a corrosive. Sodium Azide as well as being toxic, harmful to the environment and an aspiration hazard is also an [explosive](#) under certain circumstances.

Most teaching and research laboratories will contain chemicals in some form. Apart from good handling practice, the **CORRECT STORAGE** is of important in order to provide a safe working environment and prevent accidents. The following information gives an overview of safe chemical storage and segregation in all SGUL laboratories. More detailed guidance on different chemicals groupings is available on the portal.

Basic principles of chemical storage

Explosive		1. Always store like materials with like.
Flammable		It is essential that dissimilar substances are not stored together in order to prevent dangerous <u>interactions</u> e.g. flammables e.g. Ethanol must not be stored next to oxidising chemicals e.g. Potassium Permanganate and strong mineral acids e.g. Nitric Acid must not be stored next to flammables e.g. Ethanol.
Oxidising		
Corrosive		
Acute Toxicity		2. Always check the label and read the Safety Data Sheet (SDS)
Hazardous to the environment		All newly purchased chemicals will have a Globally Harmonised System of Classification and Labelling of Chemicals (GHS) label on them identifying their hazard category (e.g. flammable, corrosive, oxidising, toxic etc.). A list of commonly found chemical symbols is given to the side. Some chemicals may have more than one hazard listed.
Health hazard/Hazardous to the ozone layer		
Serious health hazard		
Gas under Pressure		

Good Laboratory Practice for storing chemicals

- If possible order solvents and other liquids in safe break bottles.
- Store the minimum stock levels of hazardous or flammable chemicals in the laboratory. If possible less than 20L of flammable liquids should be stored in total if the lab is 20M² if the lab is 40M² twice the amount can be stored providing that the cabinets are located at either end of the laboratory. More liquid can be stored in multi-user labs provided that the flammable / acid corrosive cabinets are widely spaced.
- Dispose of hazardous chemicals that are no longer required as soon as possible via the SHE office. A [form](https://portal.sgul.ac.uk/she/safety-health-and-environment-sh-e-a-z) for the disposal is available on the portal <https://portal.sgul.ac.uk/she/safety-health-and-environment-sh-e-a-z>
- Always store large breakable containers, particularly those containing liquids, below shoulder height.
- Ensure containers and bottle tops are sealed properly to avoid unnecessary leakage of fumes / vapours. Be aware that the vapours from chemicals such as Diethyl Ether are known to creep and can lead to fires in an area away from bottle.
- Never carry a bottle of chemical by its top, and always carry Winchester bottles (2.5 litres) in carriers or baskets that are capable of providing proper support.

Storage Cabinets

Acid and Corrosive Cabinets

These are made of acid resistant materials and contain a tray to contain any leakage or spillage. These must never be over filled by bottles being tilted on their sides to fit in the cabinet. If the inner lid of the cabinet is showing signs of corrosion, this should be reported to the lab manager as soon as possible. If there appears to be a build-up of vapours within the cabinet, the chemical bottles should be placed in a fume hood in order to determine which bottle is leaking.

Flammable Solvent Cabinets

These offer fire resistance of at least 30 minutes. The cabinets must never be over filled. It is recommended that no more than 20L of flammable liquids are stored in a standard 20M² lab.

Fume cabinets

Please Note! Fume cabinets are not designed or intended for the storage of chemicals. The working surfaces of fume cupboards must be kept clear of materials and containers when they are not needed for ongoing work activities. Unnecessary storage of chemicals in fume cupboards disrupts the airflow resulting in a lower level of protection to users and it can also lead to unwanted [interactions](#) which may cause fires or explosions.

When working in a fume hood, it is advisable to push items as far from the front of the hood as possible. It is always good practice to lower the front sash as far as possible when working in the hood.

Storage requirements for different chemical types

Organic liquids

These can be split into several types. The main ones used as SGUL are non-chlorinated and chlorinated chemicals.

Non- chlorinated chemicals

Organic liquids (e.g. those containing a large number of Carbon atoms) include alcohols, Diethyl ether, Xylene, Formaldehyde, Glutaraldehyde, Cyclohexane, Dimethyl Formamide etc.

Chlorinated chemicals

Chlorinated solvents are organic chemicals which contain Chlorine atoms e.g. Carbon Tetrachloride also known as Tetrachloromethane, trichloroethylene, 1,1,1 – Trichloroethane, Methylene Chloride

The safety data sheet (SDS) that is supplied with the chemical must always be consulted as part of the project risk / COSHH assessment. The SDS will indicate the storage conditions and potential incompatibilities.

Flammable liquids

The main source of danger from flammable liquids is the vapour that may be released either during handling for experiments or during long-term storage. In some cases this vapour is potentially susceptible to ignition by sparks from electric switches (e.g. thermostats) or faulty electric motors in some equipment. It is important to be aware that some flammable solvent vapours are able to creep e.g. the vapour from Diethyl Ether can creep and it can also lead to [flash fires](#) in areas away from the actual bottle.

It is important that the liquids are placed in storage as soon as possible after the end of the experiments. If solvents need to be stored in fridges, the fridge should be marked as [spark-free](#) or spark free.

Flammable solvents **must never** be stored with:

- Oxidising agents (e.g. hydrogen peroxide, nitric acid etc.)
- Reducing agents and concentrated acids (e.g. hydrochloric and sulphuric acids).

Flammable solvents are **best stored separately** from:

- Chlorinated solvents

Chlorinated solvents

Chlorinated solvents e.g. *chloroform*, *trichlorethylene* are best stored separately from flammable solvents.

They must not be stored with alkali metals such as lithium, potassium or sodium, since any mixing can cause an explosion.

Acids and alkalis

Acids and alkalis are often stored together as 'corrosives' in a metal cabinet with suitable metal spill tray to contain any spillage. Although acids and alkalis may be stored together, it is important to note that accidental mixing of concentrated materials will generate large quantities of heat and fumes.

Please note: Perchloric acid is an extremely strong oxidising agent (especially in the concentrated form) which can react explosively with organic materials. It should ideally be stored separately away from organic materials such as Acetic Acid or Ethanol or dehydrating agents such as Sulphuric acid.

Concentrated solutions of strong mineral acids e.g. 5M Nitric Acid must always be stored away from other organic reagents. Consideration must be given to the effects of acid fumes on any metal in the fittings and construction of the container. All containers / bottle tops must be suitably sealed to avoid unnecessary leakage of fumes. Parafilm is not an adequate bottle lid sealant and will quickly degrade depending on the chemical.

Oxidising chemicals

Oxidising substances (e.g. Nitric Acid, Potassium Permanganate, Bromine, Ammonium Perchlorate, Chromic acid, Hydrogen Peroxide) should be stored in a metal cabinet and away from organic matter

such as paper. Oxidising agents must also never be stored with flammable solvents, since fires and explosions can result after any spillage, even without a naked flame or heat.

Poisons and Toxins

These must be stored in a locked cabinet. The purchase of these chemicals must be notified to the SHE office. The use of Hydrogen Cyanide or Cyanide salts such as Sodium or Potassium Cyanide must be notified to the SHE office.

Controlled drugs and medicines

Any chemical that is listed under the Drugs Act 2005, Controlled Drugs (Supervision of management and use) Regulations 2013 and the Psychoactive Substances Act 2016 must be stored in a locked cupboard. If it is necessary to store them at low temperatures the fridge or freezer used should be fitted with a lock. The purchase and disposal of these must be notified to the registered licence holder who is currently Professor Mark Fisher.

Fire resistant metal cabinets are typically used for the storage of flammable solvents.