SAFETY MANUAL

Undergraduate Activities

A Guide for the Maintenance of Safety in the Laboratories.

School of Chemical and BioPharmaceutical Sciences

City Campus

Dublin

On behalf

Safety Committee

School of Chemical and BioPharmaceutical Sciences

Reviewed **September 2023**

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1.1. Useful websites

1. **TU Dublin Health and Safety Website**

https://www.tudublin.ie/for-students/safety-health-welfare/

2. **Health and Safety Authority of Ireland**

www.hsa.ie

3. **TU Dublin Chemical Risk Assessment Template**

https://www.tudublin.ie/for-staff/safety-health-welfare/safety-hub/chemical-safety/

4. **HSA Guidance on how to Undertake a Chemical Risk Assessment**

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/Your_Steps_to_Chemical_Safety.pdf

5. **HSA information leaflet on Classification, Labelling and Packaging Regulations 2008 – gives information of what goes on a label.**

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/CLP_info_sheet.pdf

6. **HSA Guidance on Classification and Links to ECHA**

https://www.hsa.ie/eng/chemicals/classification_and_labelling/ **and** http://www.clpireland.ie/

7. **Hazard and Precautionary Statements**

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/CLP_Poster_2_A4_size_%E2%80%93_Hazard_and_Precautionary_Statements.html

8. **Safety Data Sheets – explained**

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Information_Sheets/SDS_hazchem_info_sheet.pdf

9. **Code of Practice (OELV)**

https://www.hsa.ie/eng/publications_and_forms/publications/codes_of_practice/chemical_agents_code_of_practice_2020.html

10. **European Chemicals Agency**

https://echa.europa.eu/

11. UK Health and Safety Executive

http://www.hse.gov.uk/

1.2. Abbreviations

CLP	Chemical Labelling and Packaging (CLP) 2008 Regulation.
CMR	Carcinogen, Mutagen, Reproductive toxin
CRA	Chemical Risk Assessment
CPL	Chemical Packaging and Labelling (CPL) Regulations (2003 and 2004 and updates)
GHS	Globally Harmonised System
HSA	Health and Safety Authority of Ireland
OHO	Occupational Heathy Officer
REACH	Registration, Evaluation and Authorization of Chemicals Regulation 2007
SDS	Safety Data Sheet
SHWW	Safety, Health and Welfare at Work

1.3. Disclaimer

Every effort has been made to ensure that the information provided in the safety manual is correct. However, no liability is accepted by the School of Chemical and BioPharmaceutical Sciences at TU Dublin. This document serves as a reference text only and all safety information relating to the use of hazardous chemical agents must be independently checked as a part of the chemical risk assessment process.

1.4. Safety Acknowledgement Form

Please complete this form and RETAIN a signed copy of it with your laboratory reports. Your lab supervisor is also required to sign your copy.

A signed copy of this form is given to the laboratory supervisor who gives you your practical manual.

The Safety Regulations and Guidelines contained in the Safety Manual of the School of Chemical and BioPharmaceutical Sciences are for your protection.

It is important that the regulations and guidelines are followed to protect yourself and the safety of others. TU Dublin is strongly committed to providing a safe workplace for staff and students.

Although the regulations and guidelines are specific, they do not substitute for each individual's responsibility to work safely.

Additional information is available in the safety statement for the School and the individual risk assessments, policies and procedures. A list of weblinks is included to provide additional information.

Declaration

I declare that I have read the chemical safety manual, understood, and agree to abide by the Regulations of the School of Chemical and BioPharmaceutical Sciences as detailed in the safety manual, safety statement, and relevant risk assessments in addition to any additional rules and instructions communicated to me.

Signed ..... Date .....

Print Name .....

Supervisor Signature .....

2. Introduction

2.1. Safety Statements, Risk Assessments, Policies and Procedures

The primary objective of the School of Chemical and BioPharmaceutical Sciences, TU Dublin, City Campus is to ensure that the Health and Safety of all persons in the workplace is protected and that all risks are controlled as far as is reasonably practicable. The School will provide a safe place of work for all persons, who work within, or visit the School and endeavors to ensure that all work carried out under the direction of any employee of the School is appropriately risk assessed and undertaken safely.

This manual is designed for the undergraduate laboratories and complements the laboratory manual (primary source of safety information for a particular practical). This document is intended to serve as a source of information and as a guide to those persons who work in the laboratories with equipment and /or with hazardous chemical agents within the School of Chemical and BioPharmaceutical Sciences. This manual should be read in conjunction with the **School Safety Arrangements** document which includes the **Risk Assessments** for the hazards identified within the school and the laboratory manual. This is available on the TU Dublin website:

https://www.tudublin.ie/for-students/safety-health-welfare/

Additional safety information and requirements are available on https://www.tudublin.ie/for-staff/safety-health-welfare/safety-hub/chemical-safety/

This document provides guidance on how to work safely within the School and where to find relevant information in line with best practice and the requirements of current Health and Safety legislation. It outlines or refers to Risk Assessments, Policies and Procedures which have been put in place to ensure that the risks associated with the hazards encountered are as low as is reasonably practicable.

Any person undertaking laboratory work within the School or under the direction of any member of the School is required to read the safety manual and relevant Risk Assessments **BEFORE** they commence work.

The Safety, Health and Welfare at Work (SHWW) Act (2005) outlines the requirements in relation to the control of hazards in the workplace and the documentation required. The **Safety Statement** outlines how the School manages safety on a day to day basis.

There are many legislative requirements which relate to the use of hazardous substances and mixtures (Chemical Agents) in the workplace. There are a large number of Regulations which relate to the storage, transport, and use of chemical agents and the treatment and disposal of waste.

You must refer to the operating procedure and risk assessment before you use equipment within the school.

2.2. The Chemical Risk Assessment

The SHWW Chemical Agents Regulations 2001 (amended 2015) require that the **use** of hazardous chemical agents in the workplace be risk assessed. This safety manual outlines how each component of the **Chemical Risk Assessment (CRA)** is put together in the CRA template and where the information can be found. You are referred to the specific Chemical Risk Assessment for the particular procedure or laboratory practical you wish to carry out and you must comply with the prevention and protection controls as outlined. Essential laboratory practical safety information is given in the laboratory manual. In addition, there are risk assessments for the equipment you will use. In addition, where carcinogens or mutagens (Category 1A or 1B) are used the additional requirements of the SHWW Carcinogen Regulations 2001 (amended 2015) will apply.

The CRA outlines the hazards which you will encounter, and the risks involved. The precautions (protection and prevention) required and any protective equipment necessary will be documented. In addition, the emergency and first aid procedures will be outlined. It is therefore essential that you consult the **Chemical Risk Assessment (CRA)** before you undertake any practical work within the School. The CRA includes specific requirements where the chemical agents is a CMR (1A or 1B).

If a CRA for the work to be undertaken is not available, you are not permitted to commence any practical work. A CRA must be in place and all relevant SDSs must be available prior to commencement of work

Details on how to undertake a chemical risk assessment are given in the HSA guidance 'Your steps to chemical safety (See link below)

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/Your_Steps_to_Chemical_Safety.pdf

The CRA template is available on

https://www.tudublin.ie/for-staff/safety-health-welfare/safety-hub/chemical-safety/

The Chemical Risk Assessment process involves a series of steps:

- **identify hazard and risks associated with hazard,**
- **determine overall risk,**
- **apply prevention and protection measures (also known as controls),**
- **document emergency procedures (fire, spill, and first aid),**
- **put in place health surveillance if required,**
- **audit, and**
- **review.**

Each step is outlined in the following sections and links to the TU Dublin Health and Safety website and the Health and Safety (HSA) website are given as appropriate.

3. Identification of Hazards Associated with Chemical Agents

3.1. Introduction

All chemical substances are tested prior to classification and labelling to identify the hazards and risks associated with the hazardous/dangerous substance. The hazards and risks are communicated to the user primarily through the label with additional information made available through the Safety Data Sheet. A Safety Data Sheet (SDS) that is REACH (2007) compliant must be made available by the manufacturer for all chemical agents put on the market.

Europe wide Regulations (Chemical Labelling and Packaging (CLP), 2008) prescribe how chemical agents are labelled dependent on whether they are unique substances or are in a mixture.

The Chemical Packaging and Labelling (CPL) Regulations (2003 and 2004 and updates) have been replaced by CLP for both substances and preparations. These old labels (orange and black symbols, risk and safety phrases) will persist on the shelves for a number of years. This labelling format expired for substances in December 2010 and for mixtures in June 2015 in line with the new requirements of the Chemical Labelling and Packaging (CLP) 2008 Regulation.

This new format for labelling of hazardous substances follows the format of the Globally Harmonised System (GHS) which will result in a worldwide system for chemical agent labelling and SDS format. (Diamond shaped pictograms, Hazard and Precautionary statements).

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/CLP_info_sheet.pdf

3.2. Labels

Information on hazard and risk can be obtained from the label and from the safety data sheet (Section 2). We are at the end of a transition period and where we have to engage with **TWO** distinct formats to which substances and mixtures are labelled. In the next sections the requirements of the old system under CPL Regulations and the new system under CLP Regulation will be explored briefly.

3.3. Classification, Labelling, and Packaging Regulations 2008 (CLP)

(All hazardous chemical agents supplied in the future will conform to this system)

3.3.1. Classification under CLP (2008) Regulations

Chemical substances (from Dec 2010) and mixtures (from June 2015) are collated into various Globally Harmonised System (GHS) hazard classifications which are associated with their physiochemical, health and environmental hazards in accordance with the labelling legislation CLP (new system). Criteria for classifications are outlined in the legislation (purple book) and are in line with GHS.

One hazard: one classification: one label: WORLDWIDE

https://www.hsa.ie/eng/your_industry/chemicals/legislation_enforcement/classification_and_labelling/classification_and_labelling/

3.3.2. Labelling under CLP (2008) Regulations

Each hazard class of chemical agent is indicated by a pictogram indicating its hazard group. These pictograms should be clearly visible on the outside of the chemical agent container and visually identify the hazard to the user. You must be familiar with the hazard warning pictogram.

For further details on GHS please refer to the Health and Safety Authority website www.hsa.ie and http://www.clpireland.ie/.

3.3.3. Hazard and Precautionary Statements

Chemical substances are tested extensively to identify the hazard classification (refer to 2.2.) and the risk associated with the chemical agent before they are labelled. Prescribed Hazard Statements (H) are given in the CLP Regulations.

Precautionary Statements are designed to give information to the user on how to use chemical agent safely.

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/CLP_Poster_2_A4_size_%E2%80%93_Hazard_and_Precautionary_Statements.html

3.3.4. Identifying Carcinogens, Mutagens and Reproductive Toxins (CMRs) under CLP Regulations 2008.

For example, Category 1A and 1B and Category 2 carcinogens are labelled as indicated below. Cat 1A/1B are subject to the restrictions of the SHWW Carcinogen Regulations 2001 (+2015).

Classification	Symbol	Hazard statement
Carcinogen Cat 1A Cat 1B	 DANGER	H350 May cause cancer. H350i May cause cancer by inhalation.
Carcinogen Cat 2	 WARNING	H351 Suspected of causing cancer.

Mutagens (Category 1A and 1B) also carry the toxic pictogram and have hazard statements that indicate that they are potentially mutagenic.

Exposure to Carcinogens and Mutagens may result in damage to human health in years to come (have a long latent period). There for the use of such chemical agents is discouraged and must be justified in writing in the CRA.

In line with good practice, the School of Chemical and BioPharmaceutical Sciences controls Reproductive Toxins to the level required by the SHWW Carcinogen Regulations 2001 (+2015). Hazard statements indicate where a chemical agent is classified as a reproductive toxin (see section 2.3.).

We endeavor to ensure that exposure to these chemical agents (CMRs) is as low as possible and record exposures manually in the exposure log book (See Laboratory Technician).

3.3.5. Identifying Sensitisers under CLP (2008) Regulations

Hazardous substances that can cause an allergic reaction (Respiratory or Skin) carry the hazard pictogram and are labelled with the Hazard Statements outlined below.

For Category 1 (A and B) sensitisers:

DANGER H334 ***May cause allergy or asthma symptoms of breathing difficulties if inhaled***

WARNING H317 ***May cause an allergic skin reaction.***

3.4. Pregnant Students

Studies have demonstrated that a number of chemical agents may interfere with pregnancy or with the development of the unborn baby. These chemical agents can be identified from their Hazard Statements (or Risk Phrases). The first 15 weeks of pregnancy is the time when chemical agents can impact the person most. When a person is pregnant or thinks they may be pregnant, **they are strongly advised to inform her line manager or class supervisor** who will arrange for a specific 'Pregnant Student' Risk Assessment to be undertaken by the Occupational Health Officer on site in line with the

procedure outlined on https://www.tudublin.ie/for-students/safety-health-welfare/. Chemical Agents that are reproductive toxins can be identified by their associated Hazard statements. The Hazard Statements (**H340, H341, H350/i, H351, H360D /F, H361, H362**) must be considered and a reassessment of risk must be undertaken. The equivalent Risk Phrases where the risk must be reassessed are **R40, R45, R47, R49, R60, R61, R62, R63, R64**.

3.5. Safety Data Sheets (SDS)

Safety data sheets are documents prepared by the chemical supplier that give detailed information on the chemical agent and how to handle it safely. Safety Data Sheets identify hazards associated with a material and how the material can be safely handled, stored, and used. SDSs for the chemical agent used are available in all laboratories. Safety Data Sheets for a large number of chemical agents and can be downloaded from the web.

Useful websites such as http://www.sigmaaldrich.com/ireland.html (now MERCK) are where the SDS for substances can be sourced. **If you are working on a project the SDS for each chemical agent in use must be available in the area in which you work**. SDSs for all prescribed practical work are available in the laboratories. SDSs must conform to the EU standard as outlined by the REACH Regulation 2007. The format is same worldwide.

Safety data sheets can be accessed electronically from desktop computers, laptops, tablets, and phones. The relevant information from the SDS and CRA is included in the laboratory manual for all undergraduate laboratory practicals.

The **16 Sections of an SDS** include:

	Title	**Information**
1	Chemical identification	Name and manufacturer number
2	Hazards identification	Classification and Hazard statements (H) associated with the chemical agents. Details of the label...
3	Composition/information on ingredients	CAS Number, molecular formula, list of common synonyms
4	First Aid measures	First aid measures to be taken if exposed to the chemical agent
5	Firefighting measures	Responses to be taken during a fire involving the chemical agent
6	Accidental release measures	Details how to respond to a leak or spill of the chemical agent.
7	Handling and storage	The requirements for handling and storing the chemical agent safely.
8	Exposure Controls/personal protection	Information on protection requirements if exposed to the chemical agent

9	Physical and chemical properties	Information on the appearance and chemical properties chemical agent.
10	Stability and reactivity	Information on material stability and ability to react with other chemical agent.
11	Toxicological information	Information on the severe and chronic effects if exposed to the chemical agent
12	Ecological information	The impact the chemical agent has on the environment
13	Disposal Considerations	Correct disposal procedure for the chemical agent in question
14	Transport information	information on the means of transporting the chemical agent
15	Regulatory Information	Declaration of EU conformance.
16	Other Information	Relevant hazard (H) and precautionary (P) statements and other regulatory information such as a disclaimer from the producer of the SDS.

Additional information is available here:

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Information_Sheets/SDS_hazchem_info_sheet.pdf

In general, a copy of the SDS should be replaced with an updated copy every 2 years. Check that the SDS you refer to has been updated recently and gives the 'new' classifications (diamonds) and H and P statements. If the SDS for a chemical agent that you make is not available, the precautionary principal applies - look for similar compounds and liaise with the supervisor.

4. Risks Associated with Chemical Agents

4.1. Toxicological Hazards

Chemical agents with the potential to damage human health must enter the body to exert their effect. Carcinogens and mutagens can exert their effect up to 40 years following exposure.

4.2. Routes of Entry of Chemical Agents into the Body

For the chemical agent to harm the health of the person using it, the chemical agent must come into contact with them. Factors that will affect the impact a chemical has on the biological system include the following parameters:

- inherent hazard (how toxic, harmful etc. the chemical agent is),
- dose (how much gets into the body) at which it exerts its effect, and

- metabolism (what it changes into) and how long it stays in the body (and at what conc.).

There are five main routes by which chemical agents can enter the body:

Routes of Entry	
Inhalation	This is the most important route of entry. Inhalation occurs by absorption of a chemical agent through the respiratory tract via inhalation. Inhalation of solvent vapour can be very dangerous as the surface area available within the lungs for the absorption of chemical agents is many times greater than that available on the skin. OELVs apply only to airborne hazardous substances
Skin Contact	Skin contact is a common route of chemical agent entry into the body. Chemical agents can enter the body if they come into contact with damaged skin e.g. cuts and abrasions. Chemical agents may pass directly through the skin.
Ingestion	The chemical agent enters the body through the mouth (swallowing). Direct ingestion is considered unlikely in the laboratory. However, ingestion of toxic chemical agents may occur as a result of eating in a contaminated work area or with dirty hands.
Injection	Injection occurs when a chemical agent is introduced directly into the bloodstream. Injection can occur through mechanical injury from sharp objects e.g. syringe, needle or broken glass
Trans-placental and breast milk	The unborn child may be exposed to chemical agents absorbed by its mother. In addition, breast-feeding mothers expose their baby to chemical agents that are dissolved in their milk.

The most common route of exposure is by inhalation. It is therefore essential that the concentration of a chemical in the air is kept to a minimum. Ingestion of food and drink is forbidden in the laboratory to minimise the risk of ingestion.

When handling chemical agents, it is essential that contact with the chemical is kept to a minimum. Hands are washed immediately after each laboratory session or if there is inadvertent contact with the chemical (e.g. splash). For particularly hazardous chemical agents the use of appropriate chemical resistant gloves may be required. This will be indicated in the laboratory manual and in the Chemical Risk Assessment. The type of glove to be used will also be indicated (e.g. heavy-duty rubber glove, nitrile etc.; see section 8 of SDS).

In the laboratory safety measures are in place to prevent or minimise the risks associated with the use of chemical agents.

The unborn child may be exposed via their mother's exposure to certain chemical agents. This is why a specific 'pregnant person' risk assessment is undertaken in advance of laboratory work.

4.3. Physicochemical Hazards

Chemical agents can react together to cause a **fire or explosion** so it is very important to know any potential chemistry that can occur (***Physiochemical Hazard Classification***).

4.4. Environmental Hazards

Chemical agents can also **damage the environment** (***Environmental Hazard Classification***). This is of particular interest when looking at disposal.

4.5. Exposure limits

The SHWW Chemical Agents Regulations (2001) prescribe exposure limits for **airborne** hazardous substances **(OELVs).** They are quoted as a time weighted average (TWA) which means that they indicate the safe amount that a healthy adult can be exposed to for a given time (usually 8 h). For particularly hazardous substances a Short-Term Exposure Limit (STEL 15 mins) is in place. These limits are available in the Code of Practice (2018) for Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 (+2015 amendment), which can be downloaded from www.hsa.ie and is updated regularly. Every person using a chemical agent must design their working practice to eliminate or reduce to as low a level as possible their exposure to that agent. Remember the lower the OELV the greater the potential impact on human health. More can be found here:

https://www.hsa.ie/eng/publications_and_forms/publications/chemical_and_hazardous_substances/

and

https://www.hsa.ie/eng/publications_and_forms/publications/chemical_and_hazardous_substances/chemical_agents_and_carcinogens_code_of_practice_2021.html.

5. The Risk Assessment Process: Determining the Level of Risk (High, Medium or Low)

The ultimate aim of risk assessment is to determine the chances of the hazard having an effect. In this process we must consider the inherent danger (potential severity of the effect), the number of people involved and the frequency with which the hazard is encountered.

Risk = Inherent Danger x Frequency x Number Involved

likelihood of exposure / *result of exposure*	**Highly unlikely**	**Unlikely**	**Likely**
Slightly harmful	Insignificant risk	Low risk	Medium risk
Harmful	Low risk	Medium risk	High risk
Extremely harmful	Medium risk	High risk	Unacceptably high risk

Taking into account the information relating to the inherent danger and the chance of harm occuring a risk estimate is made.

In general the overall risk should be **LOW** when the precautions are in place. If you estimate the risk to be higher you must consider additional precautions to reduce the risk.

6. Prevention and Protection Measures (Controls)

The hierarchy of control is applied the order outlined below:

6.1. Elimination and Substitution

It is the policy of the School to eliminate the more hazardous chemical agents from our processes. CMRs and sensitiser use is kept to a minimum and where a safer alternate is available it is substituted.

In addition, chemical volumes are kept to a minimum and where possible the more hazardous preparations are undertaken on a microscale.

6.2. Engineering Controls

Where there is a possibility that a hazardous chemical will be dispersed into the atmosphere (Dusty or low boiling pt.) the chemical is used in a fume-hood. Fume-hoods are serviced regularly (see service details on fumehood) and must be kept free of excess equipment and chemical containers to work efficiently. The laboratory manual will indicate when it is appropriate to use a fume hood.

6.3. Systems of Work

It is essential that you follow the procedure outlined in the laboratory manual or a written procedure exactly. Lids must be replaced on all chemical containers immediately after use. In general solvents must be decanted in a fume-hood to minimise exposure to vapours. Similarly, ammonia and other fuming materials are never handled on the open bench and only handled in the fume hood. The 'Laboratory Rules' (Section 10) apply to all persons working or visiting the laboratories within the School. Areas where chemical agents are weighted out must be kept clean.

6.4. Administrative Controls

The Safety, Health and Welfare at Work Act (2005) applies to all employees, students, contractors, and visitors who work in, or use the facilities (laboratories, stores and ancillary areas) and offices in the School of Chemical and BioPharmaceutical Sciences. The laboratories in the School of Chemical and Pharmaceutical Sciences are used to carry out **only the prescribed practical work** in the undergraduate, postgraduate and research programmes. In the case of undergraduate programmes these are described in the appropriate laboratory manual. All work with chemical agents must be risk assessed using the prescribed DIT template in accordance with the SHWW Chemical Agent Regulations (2001 + 2015 amendment). Undergraduates are not permitted to work in the laboratory area unsupervised. **Lone working procedures** must be adhered to for laboratory work which is undertaken in laboratory areas where direct supervision is not in place.

Where a member of staff or a student has a disability a specific risk assessment is undertaken to ensure that they can work safely in the laboratory.

Solo working permission slip in Appendix 4.

6.5. Personal Protective Equipment (PPE)

The wearing of safety glasses is compulsory in all laboratory areas all of the time. You are not permitted to enter a laboratory area if you are not wearing safety glasses. You must have prescription safety glasses if you require a prescription lens or wear appropriate safety glasses over your prescription glasses. Contact lenses **are not appropriate** when dealing with chemical agents. Safety glasses must have integral side protection. If safety glasses are damaged in any way, they must be replaced. Safety glasses provide minimal protection against chemical splashes. Safety Goggles must be worn if determined in the CRA.

White coats (laboratory coats) are used to protect your clothes from splashes and must be worn in the laboratory. **You are required to wear a white coat in the laboratory. You are required to wear sensible shoes** (toes covered, no sandals or flip-flops) when undertaking practical work or working in the laboratory.

It may be appropriate to use **gloves** when handling certain chemical agents. The CRA and practical procedure will outline the type of gloves that should be worn. See section 8 of SDS.

False eyelashes and **false nails** should be avoided in a chemistry laboratory due to potential safety hazards. These cosmetic accessories can trap chemicals, interfere with proper PPE usage (gloves and safety glasses), and increase the risk of accidents.

Contact lenses should not be worn in a chemical laboratory due to the potential risk they pose to eye safety, as they can trap harmful chemicals against the eye's surface, leading to severe eye irritation or injury.

In general, **latex gloves are inappropriate** as they dissolve easily in organic solvents. Latex allergy is another concern.

7. Acquisition of Hazardous Substances or Mixtures (Chemical Agents)

7.1. Ordering of Hazardous Chemical Agents

- Supervisors must be satisfied that they know how to handle, store and dispose of any hazardous material before asking a technician to order the material.
- The school has a 'Chemical Inventory' system via PC where all chemical agents on site are logged (amount and location). All chemical agents on site must be logged here.
- All materials arriving in the School other than via the formal requisition/order system must be reported to the senior technician **Brian Murphy**. The amount and location of the chemical must be added to the chemical inventory and the SDS must be provided.

8. Hazards and Risks Associated with Laboratory Equipment

Laboratory equipment must be treated with care. No person shall intentionally or recklessly interfere with or misuse an appliance, protective clothing or other equipment provided in the laboratory for health and safety purposes.

8.1. Glassware

- Inspect glassware before use for cracks or breaks.
- Broken or damaged glassware should not be used.
- Dispose of broken glass in the **designated** yellow sharps bin.
- Any broken glassware should be reported to a technician so that new/replacement glassware can be put into use.
- Glassware **must be washed clean of chemical agents** after use and before you place it on the trolleys provided.

8.2. Glass-Apparatus

Ensure that you fit the pipette pump to the pipette carefully; keep hands close together as instructed.

Be particularly careful when connecting rubber tubing to condensers. It is a good idea to dip the end of the rubber tubing in some water and hold hands close together when attaching the tubing. Connect the tubing to the condenser before assembling any distillation or reflux apparatus.

Take care when clamping glassware to ensure that it is firmly held. Do not over tighten, as this will damage the glass.

Be particularly careful when using any instrumentation. Consult the operating manual and Risk Assessment before use and/or consult supervisor or a technician.

Consult with the laboratory supervisor or technician if you are unsure.

8.3. Heat

- Never leave a lit Bunsen Burner unattended.
- Never leave a distillation apparatus or reflux apparatus unattended.
- Heating mantles and hot plates are not ex rated. Organic solvents vapours can be ignited by the heat generated.
- Do not operate hot plates or heating mantles when organic solvents are in use.
- Never use a Bunsen burner where organic solvents are in use.
- To avoid burns use tongs or a retort clamp to manipulate hot glassware.
- Allow distillation or reflux apparatus to cool to room temperature before dismantling it.
- If there is a fire in the fume hood turn off the extraction system immediately.

8.4. Housekeeping

All laboratory areas must be kept tidy. It is essential that the bench areas are kept tidy during practical work. Lids must be replaced on all chemical agents and reagents. Bags and coats must be stored under benches or in the designated areas so that they do not present a trip hazard. Students are not permitted to leave the lab area until the supervisor is happy that their bench area has been cleaned.

All water spills must be mopped up immediately. Refer to section 8 for Spill Procedures.

All chemical spills must be mopped up immediately. Be particularly careful at the balances when weighing out reagents.

All retort stands are stored off the ground in designated areas.

Chemical agents are returned to their designated storage area following use. The minimum amount of chemical is retained in the laboratory area.

All chemical agents must be labelled appropriately.

All products or reagents being saved for projects or follow on lab must be labelled with the date, chemical name, hazard classification and hazard statement and the persons using it.

8.5. Compressed Gases

There are two main hazards associated with compressed gases.

1. Mechanical and physical hazards associated with the size, shape, weight of the cylinder and the pressure of the gas within the cylinder.
2. Hazardous properties of the gas itself.

A SDS must be available for the gas contained in the cylinder.

Only trained personnel are permitted to move a cylinder (Technicians who have had manual handling training).

Gas cylinders may only be operated by the supervisor (who is familiar with the procedure) in the first instance. The pressure in the head of the regulator is always released when the cylinder is turned off. Hazardous gases are pumped in from cylinders which are secured outside the laboratory area. A specific code of practice is in place for the handling and storage of gas cylinders within the School.

8.6. Needles

Needles can pose significant risks if not handled with diligence. The sharp ends that enable their functionality also to make them a potential source of injury. Accidental pricks or cuts can lead to exposure to hazardous substances or biohazards, potentially endangering the safety and health of laboratory personnel. Moreover, needles are often used in conjunction with volatile or toxic substances, magnifying the consequences of mishandling. Improper aspiration or dispensation can result in spills, releases of harmful fumes, or unexpected reactions, jeopardising both the experiment and the well-being of individuals present.

- Only use a needle where no reasonable alternative is available.
- Ensure cytotoxic/sharps bin is adjacent for disposal of used needles/syringes.
- For the majority of applications an 18 g x 1.5 [1.2 x 40mm] blunt fill/drawing up needle should be used to reduce the risk of needle stick injury.

How to attach a needle to a syringe tip

- Remove syringe from packaging.
- Remove capped needle from packaging.
- Holding the capped needle at the collar and the syringe by the main body push/twist the needle into place.
- Only remove the cap when ready to use.
- Holding the base of needle in place gently remove the cap.

Disposing of a used needle/syringe

- Once used, dispose of the syringe immediately in the sharps/cytotoxic bins provided.
- Never attempt to change or recap a used needle.

Video: https://www.youtube.com/watch?v=bEeAo2jCJjw

9. Responsibilities and Training

9.1. Training Requirements

All staff working in the laboratory area must be trained in:

- emergency response,

- emergency first aid or occupational first aid,
- manual handling [on-line (academic) or face to face (technical, lab aids and administration)],
- chemical safety and risk assessment training, and
- HSA Training Modules (https://hsalearning.ie/):
    - Chemical Safety in the Workplace
    - Chemical Safety in the workplace (Level 2)

      (Certs should be printed to provide evidence of training).

9.2. Responsibilities of Academic Staff and Laboratory Demonstrators

The academic staff are responsible for the design and supervision of the practical work assigned to them in laboratories in accordance with the teaching and research programmes. Under the terms of the Safety, Health & Welfare at Work Act, 2005, the academic staff member responsible must identify any hazards associated with the particular practical work, assess the risks involved and take means to eliminate or reduce these risks as far as is possible. The programme of work in the laboratories must be set out in a laboratory manual, which must contain the Hazard Identification/Risk Assessment. The academic staff member or the person with responsibility for the laboratory session must ensure the implementation of these procedures and review them annually or more often as required. In addition, the staff member must communicate the risks associated with any hazard to students and supervise the students to work safely. Academic staff must supervise students to clean glassware clean of chemical agents before placing glassware on the trolleys provided.

The academic staff member is responsible for ensuring that the laboratory rules are adhered to by students and visitors in the laboratory area. Academic staff must wear PPE as appropriate in the laboratory area. Laboratory demonstrators must support the academic member of staff in the management of safety in the laboratory and follow all reasonable instruction in relation to safety.

The academic staff member has responsibility to report all accidents and incidents that occur in the laboratory on the TU Dublin incident report form in liaison with the Head of School.

9.3. Responsibilities of Technical Staff

The technical staff are responsible for overseeing the maintenance of the laboratory facilities within the School and for the preparation of materials and equipment for the practical classes as required by academic staff. Details of materials, (chemical agents, solutions, apparatus, etc.) required for a given laboratory class should be communicated in writing and in good time to the technician staff involved, by the academic staff member responsible. Technical staff should be available in the laboratory for the duration of the laboratory session. Technicians must wear PPE as appropriate in the laboratory area.

It is the responsibility of each technical member of staff to conduct risk assessments for the preparation of chemical reagents used in practical classes.

9.4. Responsibilities of Laboratory Aids

Laboratory aids are responsible for ensuring that the laboratory areas are clean and tidy. They must ensure that glassware is cleaned between classes and ready for use. Laboratory aids must wear PPE as appropriate in the laboratory areas.

9.5. Responsibilities of Students and Postgraduate Students

Students must adhere to the laboratory rules; follow the instructions of the laboratory supervisor and instructions outlined in the laboratory manual or written procedure. Students must take advice from all staff on matters concerning Health and Safety. A student must conduct his or herself in a manner that does not compromise their own safety or the safety of anyone else in the laboratory. Students must immediately report any accidents or dangerous incidents or occurrences to the laboratory supervisor in the first instance or to the laboratory technician. Students are required to report any defects in equipment. Students are required to clean glassware of chemical agents prior to placement on the trolleys provided. Any broken or chipped glassware must be reported to the lab supervisor or laboratory technician. All students must wear PPE as appropriate in the laboratory area.

10. Laboratory Rules

10.1. General Laboratory Rules

The following laboratory rules are designed to minimise the risks associated with hazards encountered while working in and visiting a chemical laboratory in the School of Chemical and Pharmaceutical Sciences. Such risks may arise from contact with chemical agents, glassware, and certain items of equipment. Therefore, the School has adopted and enforces 'Rules' for all who work in or visit the laboratories to ensure their safety, health, and welfare. These general rules apply to all persons, lecturers, technicians, laboratory aids, postgraduate, research students, and undergraduate students working in the School of Chemical and Pharmaceutical Sciences laboratories. Visitors must also comply if they wish to enter the laboratories. Failure to comply with these rules may lead to disciplinary action.

- The laboratories must only to be used by staff and registered students who are involved in work set out in the prescribed undergraduate and postgraduate programmes or people who have been given permission to do so by the Head of School. A record of this permission is kept by the administrator in the school office in the School of Pharmaceutical Sciences.
- Unauthorised visitors are not allowed in the laboratories.
- **Never work alone in the laboratory!**
- It is advised not to wear rings in the laboratory area. People wearing a wedding band do so at their own risk.
- Sensible footwear must be worn in the laboratory (no sandals or high heels).
- Eating, drinking and the storage of food or drink, for human consumption, in the laboratories are forbidden.
- The use of radios, personal audio devices (including headphones, earphones, AirPods), computer games, and other recreational activities is prohibited.

- **Electronic devices** (such as mobile phones and tablets) may be utilised **exclusively for studying and learning purposes in the laboratory**, provided they are adequately shielded from chemicals by being enclosed within a securely sealed zip lock bag.
- All accidents or incidents must be reported and an ***Incident Report Form*** available at the porter's desk or at the Occupational Health Office filled out by the supervisor or demonstrator and submitted to the Occupational Health Office.
- The use of hazardous biological and radioactive material is strictly prohibited in the chemical laboratories.
- All people must conduct themselves in a responsible manner in the laboratory and not act in a way that might constitute a danger to themselves or others.
- Staff should inform the Head of School of any condition that would be aggravated by working in the laboratories, e.g. asthma, dermatitis, diabetes, epilepsy, allergies, pregnancy etc. The Head of School will undertake to preserve the confidentiality of such information if required. Postgraduate and undergraduate students likewise must inform their laboratory supervisor of any such conditions, which require special precautions to be taken. Confidential information will be respected.
- No one is permitted to remove any chemical from the laboratory. This is considered a serious offence and will merit disciplinary action.
- A declaration must be signed by all persons working in the laboratories that they have read the Safety Manual, which they have read it and have agreed to abide by its contents.
- The 'lone working' form must be filled in and signed off with the appropriate supervisor.
- A copy of the safety manual is available to all visitors upon request.

10.2. Personal Protective Equipment (PPE)

White Lab coats and safety glasses are required as standard. Employees of TU Dublin can avail of safety glasses or prescription safety glasses and white coat free of charge. Contact the Head of School to arrange this. Visitors and students must come equipped with the PPE requirements.

10.3. Additional Rules for Students

10.3.1. Undergraduate Students.

In addition to the General Laboratory Rules (refer to section 10.1), undergraduates, because of their inexperience and as part of their training in working in chemical laboratories, must also observe the following procedures when working in the laboratory.

Students must:

- **never** enter the lab when the supervisor is not present,
- **wear** safety glasses and a white coat when entering and working in a laboratory,
- always obey the directions of the lecturer or demonstrator in charge,
- read (before entering the lab) and comply with the safety instructions outlined in the laboratory practical manual,

- avoid inhaling vapours/gases/dust associated with a chemical,
- never smell intentionally or inhale or taste a chemical,
- always use chemical agents with adequate ventilation or in a chemical fume hood as outlined in the chemical risk assessment,
- use hazardous chemical agents only as intended and for their intended purpose,
- **NEVER** use mouth suction to fill a pipette. Use a pipette pump or other pipette filling device,
- ensure that Bunsen burners, heating mantles, hot plates, and other sources of ignition are removed before working with extremely/highly/flammable chemical agents,
- **be punctual for practical classes. Students who are not present at the beginning of the class (when safety instructions are given) will not be permitted to enter this lab,**
- notify the laboratory supervisor of any medical condition, as outlined in the General Laboratory Rules (section 10.1) at the beginning of the practical session,
- tie long hair back,
- work at designated benches in the laboratory and only carry out work designated by the laboratory supervisor, in an organised fashion; assemble glassware and apparatus, label all flasks, beakers & bottles, use fume hoods, dispose of waste safely, etc.,
- consult the supervisor before turning on apparatus (e.g. distillation) or using instrumentation,
- follow the direction of the laboratory supervisor in case of emergency,
- at the end of a laboratory practical, apply good housekeeping practice; rinse glassware, replace chemical agents on shelf, side bench or solvent cabinet, and tidy/wipe up bench and ensure that the balances are kept clean,
- not place chemically dirty glassware on trolleys for wash-up,
- seek the permission of the supervisor when leaving the laboratory,
- not take chemical agents, apparatus or instrumentation from any of the laboratories or move them between laboratories without express permission of the supervisor, and
- wash hands at the end of each laboratory session.

In addition to the above the following must be followed:

- Chemical Risk Assessments for the practicals and Safety Data Sheets for the chemical agents used must be available in the laboratory where the practical/project work is taking place and the CRA is available.
- Retort stands **must not** be stored at ground level.
- All white laboratory coats must be fastened closed, and the sleeves should not be rolled up. This increases the chances of chemical agents entering the body through the skin.

- All chemicals stored in the fridge or freezer must be labelled and leak tight.
- It is forbidden to bring chemical agents on-site to TU Dublin or to remove chemical agents from the practical laboratories.
- Senior students should not begin a project unless a hazard identification and Risk Assessment is made and submitted.

10.3.2. Additional Rules for Postgraduate Students and Research Workers

In addition to the General Laboratory (6.1) and because of the nature of the experimental work inherent in research programmes, postgraduate students, researchers, and their supervisors must also observe the following rules:

- Work only when hazard identification and the chemical Risk Assessment has been completed and appropriate controls are in place and only under the direction of their supervisor.
- Work at a designated bench, which should be kept clean and tidy.
- Take care in carrying out new reactions and take all necessary precautions to avoid danger to themselves and others.
- Consult via their supervisor with the School Safety Committee if they intend to undertake any potentially dangerous reactions or use hazardous chemical agents.
- Observe the Code of Practice particularly for the Disposal of Waste Organic Solvents.
- Store personal belongings in lockers provided outside the laboratory.
- Obtain permission of the laboratory supervisor should they wish to work in a laboratory where undergraduate class is in operation.
- **Never** work alone unless a 'lone person' risk assessment has been carried out and the 'lone working form filled in.

Postgraduate and research students must tidy-up, clean and remove all belongings from their laboratory bench and other storage areas (fridges, desiccators etc.) when they finish the practical work component of their research. The postgraduate student supervisor is responsible and must ensure that this occurs.

The School recognises its duty of care to students and others, who are in turn obliged to co-operate with staff implementing the terms of the Safety, Health & Welfare at Work Act, 2005. All students must co-operate with the lab supervisor in matters of Health and Safety. All employees, students, contractors and visitors must abide by the ***'General Laboratory Rules and observe the rules for students.'***

10.3.3. Project Work

It is the responsibility of the academic supervisor to ensure that any project work undertaken is adequately risk assessed. Particular attention should be paid to hazardous processes such as vacuum distillation, flash chromatography, working with pyrophoric materials, working with CMRs (Cat 1A/1B),

and any non-routine operations which will be undertaken by the student. A chemical risk assessment must be in place, but all other hazardous procedures must be risk assessed.
It is the responsibility of the academic supervisor to ensure that adequate supervision is in place for the more hazardous aspects of project work.

With prior approval from the project supervisor, adequate precautions taken, notification to relevant staff, and the completion of requisite forms, chemistry laboratory project work can be safely extended over lunch breaks and even overnight, ensuring that research continuity is maintained and objectives are met while upholding safety protocols. *Overnight reactions should not become the norm or be used to give an unfair advantage to one project student over another in terms of lab time.*

The following rules **must** be followed:

- Overnight/lunchtime reaction form must be completed and signed by the project supervisor.
- Only allowed in circumstances where the project supervisor deems necessary, e.g. reactions are required to run for greater than a 3 h block or where a reaction cannot be completed within 7 h in the case of an overnight reaction.
- For each reaction there needs to be a risk assessment – this can form part of the student project risk assessment.
- The reaction setup needs to be inspected and signed off on by the project supervisor at the start of lunch/end of labs.
- A signed copy of the **Overnight/Lunchtime reaction form** (available upon request) must be attached to the fume cupboard sash.

Important: If there is no signed & dated form, experiments will be shut down by technical staff or the laboratory supervisor at the time.

All project students must cooperate with their project supervisor in matters of health and safety.

11.Chemical Agent Storage and Waste Disposal

Each stage of the chemical's life in the School is examined with a view to minimising the risks associated with it.

11.1. Chemical Agent Storage

Proper and correct storage of all chemical agents must be in place to minimise hazards associated with leaks, spills, and accidental mixing of incompatible chemical agents. The SDS can be used as guidance before storing the material in order to obtain information on the materials incompatibilities. A minimum amount/number of chemical agents and solutions should be stored in the laboratory area. Extremely/highly/flammable chemical agents must be stored in flameproof cabinets and safety fridges as appropriate. Chemical agents are stored based principally on their UN-Hazard class (section 14 of SDS) in dedicated chemical storage areas. The technical staff are responsible for the proper storage of chemical agents in the laboratory and storage areas for which they have responsibility.

When chemical agents are stored in a laboratory the following precautions should be taken:

- All chemical agents' containers (including samples) in the laboratory areas must be labelled with the name of the chemical, its Hazard Class and Risk Phrases/Hazard Statements. The name of the person labelling the chemical must also appear. A disposal date must also be given.
- Check with the laboratory technician if you intend to store materials in the laboratory.
- Some chemical agents degrade during storage and may become more hazardous and therefore it is crucial that quantities of hazardous chemical agents stored be kept to a minimum.
- Chemical agents that are affected by sunlight must not be stored in an area where they can be exposed to direct sunlight.
- Chemical agents must not be stored under sinks.
- Leaking or damaged packages must be removed to a safe area for repacking or disposal.
- Solids should be stored on shelves or in cabinets unless stated otherwise.
- All chemical agents stored in the fridge and freezer are leak tight and fully labeled.

11.2. Refrigerators

Only materials unstable at room temperature, or crystallising solids should be stored in the 'safety' explosion-proof refrigerators in the laboratory areas. All samples must be fully labelled indicating the hazards and risks associated with the material. The 'owner and date' must also be clearly indicated. All samples must be removed from the fridges when project work is over.

All samples in the fridge or freezer compartment must be completely sealed to ensure that solvent vapours do not escape.

11.3. Chemical Waste Disposal

It is extremely important that all the waste produced in the School of Chemical and Pharmaceutical Sciences is disposed of in a correct, safe, and legally compliant manner to avoid any unnecessary problems. Failure to dispose of waste correctly may result in prosecution of both the School of Chemical and Pharmaceutical Sciences and the individual involved. All chemical waste containers must be clearly labelled to indicate the nature of the waste material.

It is the responsibility of the technical staff to organise the removal of 'collected' hazardous waste from the site.

Methods of disposal of waste are documented in the practical procedure in the laboratory and the SDS.

General methods of disposal for SMALL amounts of waste are given in the practical procedure and CRA.

The technician in each laboratory is responsible for the emptying, collection, and removal of the 'waste solvent' from the fume-hoods and hazardous solid chemical waste.

11.3.1. Disposal of Project Samples

It is the responsibility of the **project supervisor** and the **student** to ensure that all chemical agents, samples, and materials are properly labelled for disposal. It is the responsibility of the supervisor to liaise with the technician in charge of the laboratory to ensure that this occurs in line with procedure outlined in the relevant CRA.

11.3.2. Broken Glass

Glass bins are provided in laboratory areas for the disposal of **clean** broken and waste glass **only.** Broken glass should never be put in the general rubbish bins.

Waste	Means of Disposal
Aqueous waste	All aqueous waste is neutralised and is poured down the sink and diluted well with plenty of water.
Solid	All solid samples must be submitted to the supervisor in a sample bottle. Consult the supervisor if there is any solid waste and it will be disposed of appropriately.
Organic	All organic liquid waste (not water miscible) is to be neutralised and poured into the waste solvent container labelled organic waste in the fume cupboard.
Chlorinated	All chlorinated organic waste is to be neutralised and poured into the chlorinated waste solvent bottle

12. Emergency Procedures

Appendix 1 gives the information displayed in the safety point notices on the TU Dublin City Campus.

13. Chemical Spill Procedures

ENSURE YOU KNOW HOW TO CLEAN UP SPILL BEFORE YOU APPROACH ANY SPILL.

DO NOT APPROACH SPILL IF YOU ARE NOT SURE.

13.1. General Spill procedures

In the case of a spill or leak of chemical the following procedures should be carried out:

- The area must be cordoned off and access to the area restricted.
- The area must be kept well ventilated.
- Only attempt to clean up a spill if you know what has spilt and how to clean it up safely. If not – contact the technician in the lab area.
- **APPROACH THE SPILL ONLY IF SAFE TO DO SO.**
- **WEAR PPE: SAFETY GLASSES AND GLOVES (check type in CRA or SDS) before approaching the spill.**
- If the spilled material is extremely/highly flammable – all sources of ignition must be turned off if safe to do so.
- The CRA must be consulted.
- The SDS for the chemical concerned must be consulted before dealing with the spill.
- The source of the leak should be identified and sealed if safe to do so.
- All waste and all contaminated items generated by spillages must be disposed of in a suitable manner.
- Individual spill procedures are outlined in the laboratory manual and in the CRA.

13.2. Spill procedure (up to 250 cm^3)

In addition to consulting the laboratory procedure and CRA:

- **WEAR THE APPROPRIATE PPE: gloves and safety glasses.**
- Mop up solid waste (up to 5 g) with a damp tissue and rinse well with water before putting it in the bin.

- Wipe up organic solvent spills (b.p. < 100^{o}C) with tissue and leave in the fume cupboard to evaporate for at least 1 hr. Inform the technician.
- Acid or base spills must be neutralised and diluted well before collection. Rinse any tissue used well with water before disposal.

13.3. Spillage procedure (> 250 cm^3)

- Supervisors must be consulted so that they can deal with the situation appropriately.
- Spillage kits are available in the laboratory. All spillage kits must contain the following: absorbent booms, absorbent pads, dry absorbent material, bush and pan, general purpose broad range disposable mask, Heavy duty gloves, Safety glasses waste bag/ empty container.
- Solid waste must be collected with the minimum dust generation and disposed of as hazardous waste in consultation with the technician.

13.4. Liquid spills clean up

- Only attempt to clean up a liquid spill if it is safe to do so.
- Do not tackle a clean-up procedure by yourself. As a minimum, there should be two people involved, e.g. one to clean up the spill and one to observe.
- Dyke the spill area to prevent it spreading. Cover the spilt liquid with an appropriate absorbent material.
- Carefully shovel or place the used absorbent into the disposal container.
- Wash or sweep up the remaining material (this depends on the hazard to the environment). Many organic solvents may simply be allowed to evaporate at this stage.
- Clean yourself and any equipment as close to the site as possible, without spreading the material around.
- Ventilate the area thoroughly before personnel re-enter.
- Place material in a suitable container and contact a registered disposal company to arrange for safe disposal.

13.5. Solid spill clean up

- Only attempt to clean up a solid spill if it is safe to do so.
- Do not tackle a clean-up procedure by yourself. As a minimum there should be two people involved, e.g. one to clean up the spill and one to observe.
- Cover the spilt powder with wet paper towels (or similar items) or use damp sand.
- Carefully shovel this mixture into the disposal container. This method should not be used on substances that in contact with water emit flammable gases or become spontaneously flammable.
- Clean yourself and any equipment as close to the site as possible, without spreading the material around.

- Place material in a suitable container and contact a registered disposal company to arrange for safe disposal.

14.Fire

The building has automatic fire alarm systems including heat and smoke detectors. All staff and students must be familiar with the operation of safety equipment (fire extinguisher and fire blanket) in the laboratory and the evacuation procedures.

For undergraduates, instruction in the use of the safety equipment will be given by the class supervisor, normally during the first laboratory session in the semester, which will draw the attention of students to the following:

- fire action notice (Appendix 2) on the wall of the laboratory,
- fire exit and escape routes,
- evacuation procedures,
- usage of fire extinguisher (CO_2) and fire blanket, and
- assembly points.

14.1. Fire extinguishers (CO_2)

The fire extinguishers available in the School of Chemistry and BioPharmaceutical Science contain carbon dioxide (CO_2) and dry powder.

Do:

- use on flammable liquids.
- use on live electrical equipment.

Instructions are provided for all fire extinguishers. These instructions must be read so that one can understand what to do if the fire extinguisher must be used.

14.2. Fire Blankets

Fire blankets are available in each laboratory although their usefulness is limited. They are located beside the fire extinguishers usually on the wall nearest the door. If a fire outbreaks on the bench, cover the fire with the fire blanket if safe to do so. If a person is 'on fire' cover the individual with the fire blanket if safe to do so. The supervisor will demonstrate how to hold a fire blanket.

14.3. Fire caused by gas leakage

It is imperative that all members of staff know how to turn off the gas supply in their area in an emergency.

If a fire has been caused by leaking gas (e.g. from Bunsen burner tubing), keep in mind the following:

- fire involving burning gas must **NOT** be extinguished until the supply is isolated as unburnt escaping gas will form an explosive atmosphere making a serious incident worse.
- any incident involving the uncontrolled escape of gas is a serious matter. If the leakage cannot be stopped immediately the building should be evacuated.

14.4. Fire in a fume hood

- **Turn off the extraction if safe to do so.**
- Use a fire blanket or extinguisher if safe to do so.
- Close the sash if safe to do so.

15.First aid

15.1. General Information

First aid offers immediate care for a person who is injured. It is intended to prevent further injury or illness. The objectives of first aid are to:

- control conditions that might endanger life,
- prevent further injury or chemical contamination,
- relieve pain and treat shock,
- make the patient as comfortable as possible, and
- hand over to an occupational first aider when they arrive on scene.

This is done until the emergency services arrive.

First aid procedures are given in Appendix 3 and are displayed in every laboratory.

There are several Occupational First Aiders in the School of BioPharmaceutical and Chemical Sciences. Every staff member working in the laboratories has emergency first aid training, in the case of an injury the first aid procedure regulations must be adhered to.

Occupational First Aiders	Contact
Laura Dunne	(087) 1187687
Sarah-Louise Hassett	(01) 220 7161

Greg Burke	(01) 220 5653 or (087) 637 0537
Marc Davis	(087) 119 9364
<u>Sodexo</u> Jamie Young Tony McGuinness Emila Kulej David Dowling Gavin Ivory	1800 400 310

15.2. Safety showers

Safety showers are provided in CQ418, CQ420, CQ422, CQ424, CQ426, and CQ427. The safety shower is capable of drenching the subject immediately and is used when a person comes in contact with a large amount of a hazardous substance. Clothes should be removed in the shower if safe to do so to minimise contact with the chemical. Clothes should be cut off in preference to pulling clothes over the head where eye and respiratory contamination is possible.

15.3. Eye wash station

An eye wash station provides a steady stream of water directly into the eye. Eye wash stations are located in every laboratory. Persons working in the laboratory must familiarise themselves with the location of the eye wash before chemical work begins. Eye wash stations may be required if a chemical agents substance enters the eye. It is imperative that the chemical is removed immediately: the eye must be rinsed within 45 seconds. If this does not happen permanent damage may have been done. The eye must be washed for a minimum of **<u>15-20 minutes</u>**. The laboratory supervisor will instruct the class on how to proceed in the event of a chemical splash in the eye. Following any eye injury attendance at the eye and ear hospital of a medical practitioner is required.

16.Emergency Contact Information

16.1. General Contact Information

CONTACT	CONTACT INFORMATION	OPENING HOURS
Occupational Health Officer	Edel Niland (086) 389 1080	9.00 a.m. – 5.00 p.m.
Medical Centre, Grangegorman	https://www.tudublin.ie/for-students/student-services-and-support/student-wellbeing/student-health-centres/ Medical Centre, Rathdown House (First floor) (01) 220 5700	9.00 a.m. – 5.00 p.m.
Emergency Services	112/999	Anytime

16.2. Occupational Health Officers

Occupational Health Officers (OHO) are contactable by mobile phone from Mon – Fri (9am – 5pm):

Location	**Contact number**
Grangegorman	**Edel Niland – (086) 389 1080**

The OHO will undertake pregnant employee and pregnant student risk assessments and should be contacted as soon as the person knows they are pregnant. The OHO can also offer advice and support in matters of health and safety.

16.3. Safety Representatives

The safety representative has the right to represent the views of employees in relation to matters concerning health and safety and he/she facilitates consultation.

The safety representative aids in consultation in relation to health and safety matters. Where you have a concern in relation to health and safety you should bring this to the attention of your line manager. The safety representative can help and advise you about your concern.

17.Accident and Incident Reporting

It is very important that all accidents and incidents are reported. All incidents are reported on the TU Dublin Incident Report Form:

Incident Report forms are available:

- online https://forms.office.com/Pages/ResponsePage.aspx?id=yxdjdkjpX06M7Nq8ji_V2iTIVfvEBClFgjksQYvZ3TlUMko0RkNQT1NGOEFMNUJSTzM2UUNJVkxUQS4u

and in the following areas:

- Porter's desk/reception areas,
- Building Maintenance Managers Offices,
- Occupational health Offices, and
- Faculty Administrators' Office.

All sections of the form must be completed. The completed form must be signed by the reporting person and notified to their line manager. The manager/supervisor will forward a copy of the form to the Health and Safety Officer and retain the duplicate in the Incident Report book.

Incidents occurring within the School will be investigated by the head of School, the injured party and any other involved employee. The investigation results and remedial measures must be summarised on the Incident report form. Further details are available here: https://www.tudublin.ie/for-students/safety-health-welfare/.

18.Appendices

18.1. Appendix 1 – Safety Notice Point

- Occupational health Officer Edel Niland can be contacted on **086 389 1080**.
- The Parent Safety Statement is located in the Director of Science Faculty Office
- The School Safety Arrangements documents are available from each Head of Faculty/Function
- Emergency First aid kit is available at Reception/Porters Desk

- First-aid boxes are sited in each Laboratory.
- Defibrillators are available on each floor and are also sited at Reception/Porters Desk.
- Incident report books are sited at:
    - Faculty administrators Office,
    - Building Maintenance Manager's Office,
    - Occupational health Office, and
    - Reception Areas/ Porters Desk.

  Hazard Report forms are available from https://www.tudublin.ie/for-students/safety-health-welfare/reporting/.

  Fire register, Emergency manual, and Emergency phone numbers are located at Reception/Porters Desk.

  Student Medical Centre, Rathdown House (First floor), (01) 220 5700.

  The Health and Safety Officer for the TU Dublin City Campus is Edel Niland, (086)389 1080.

18.2. Appendix 2 – Action on discovering a fire

Any person discovering a fire, must:

- sound the alarm,
- dial 112 or 999 to call the fire brigade, and
- attack the fire if possible, using the correct appliances provided.

On HEARING the FIRE ALARM (Siren), you must:

- leave the building by the nearest stairwell and assemble at THE ASSEMBLY POINT A - Rathdown House,
- close all doors behind you, and
- report to assembly area.

https://tudublin.ie/for-students/safety-health-welfare/emergency-preparedness/fire-and-evacuation/grangegorman-campus/

Do Not Take Risks

Do not return to building for any reason until authorised to do so!

18.3. Appendix 3 – First Aid Procedures

Code of Practice for First Aid within the Chemical Laboratory

The general first aid procedures below are merely for guidance, they are not meant as a replacement for certified first aid training. Specialised or unusual treatments may be necessary for some substances, e.g. hydrofluoric acid burns, cyanide poisoning. Please refer to the relevant Safety Data Sheet (SDS).

18.3.1. Superficial cuts/wounds

- Inspect the wound for any foreign material.
- Wash/clean the wound with water and clean with a sterile wipe.
- Cover the wound with an appropriate dressing or plaster to prevent contamination.
- Don't forget to **USE GLOVE** when dealing with all wounds.

18.3.2. Serious lacerations/bleeding

- Apply gentle pressure to the wound to stem bleeding.
- Elevate the area if possible.
- Apply dressing to prevent contamination of the wound and to stem blood loss.
- Seek further medical assistance (ambulance may be required if bleeding is severe).
- If an item is lodged or impaled in the wound (e.g. a broken pipette) do not attempt to remove it. A dressing should be applied around the wound to help stem blood loss and to stabilise the object. Call for an ambulance (999/112). Inform the porter's office to assist ambulance crew on arrival.

18.3.3. Chemical inhalation

- If safe to do so, remove the casualty into fresh air.
- Instruct the casualty to avoid physical exercise (even if they are not experiencing any symptoms).
- Transportation to hospital may be required (***by ambulance***, if necessary). The Safety Data Sheet for any chemical agents that were inhaled should be provided to any attending paramedics and accompany the casualty to hospital.
- In many cases oxygen therapy may be of benefit to the casualty. This should only be administered by appropriately trained and certified people.
- If a first aider is required to breathe for an unconscious casualty during the application of **CPR**, a facemask should always be used. This provides a barrier and aids in preventing the

inhalation or absorption of hazardous chemical agents (as well as the transfer of communicable diseases).

- The symptoms of a chemical exposure should be treated as appropriate, giving consideration to the product label, the Safety Data Sheet and any formal first aid instructions.

- Inhalation of certain chemical agents can result in the onset of delayed pulmonary edema. These chemical agents should be identified during the Risk Assessment stage. Anyone with the potential for exposure *via* inhalation, and local area first aid attendants, should be made aware of the need to obtain medical attention immediately.

18.3.4. Chemical eye contact

- Irrigate with copious quantities of cool running water, for at least 20 minutes.

- The eyelid of any affected eye should be lifted up and the area beneath the eyelid irrigated as well.

- Seek medical treatment immediately.

18.3.5. Chemical skin contact

- Remove contaminated clothing and footwear. Care should be taken not to affect unexposed areas of the casualty, or yourself.

- Wash the affected areas with running water. The length of time that affected areas should be washed will vary depending upon the chemical, its hazards, and characteristics. If unsure, wash the affected area for at least 20 minutes.

- In the case of common laboratory acids, a 10% solution of sodium bicarbonate may be used to neutralise acid remaining on the skin.

- Do not attempt to pick off any solid chemical contaminants that are attached to the skin.

- Cover the affected area with a sterile, non-stick dressing.

- If necessary, seek emergency medical treatment.

- Remember that certain chemical agents, such as hydrofluoric acid, have specific treatments associated with their exposure. Anyone who may be potentially exposed to a chemical requiring specific treatment, and local area first aid attendants, should be made aware of the specific treatments ***prior*** to the use of the chemical.

18.3.6. Chemical Ingestion

- Care should be taken to avoid contact with any chemical, especially if **CPR** is required.

- Ring for an ambulance. Inform the porter's office to assist ambulance crew on arrival.

- Transfer casualty to hospital by ambulance.

- Ensure that a copy of the relevant Safety Data Sheet is provided to the attending paramedics and accompanies the casualty to the hospital.

Important contact details

Certified Occupational First Aiders		
	Location	**Tel. No.**
Laura Dunne	Kitchens: LG & Restaurants: G	(087) 1187687
Sarah-Louise Hassett	CQ-318	(01) 220 7161
Greg Burke	CQ-312	(01) 220 5653 or (087) 637 0537
Marc Davis	CQ-026	(087) 119 9364
Sodexo Jamie Young Tony McGuinness Emila Kulej David Dowling Gavin Ivory	Grangegorman Campus	1800 400 310
Other important details		
Porters Office	Ground floor - main entrance	(01) 220 7163
Emergency Services	Ambulance/Fire brigade/Police	999/112
Student Health Centre	Rathdown House	(01) 220 5700
Occupational Health Officer	edel.niland@tudublin.ie	(086) 389 1080

EMERGENCY FIRST AID PROCEDURE TU Dublin City Campus

Refer to the 'Emergency Procedures'

Safeguard your own safety, then assess the nature of the incident:

Slight

- **For straight-forward injuries that can be dealt with immediately**:

- ✓ Contact **First Aider:**
    - **Porter's Desk: (01) 220 7163**
    - **See list on Lab door of occupational first aiders in School.**
- ✓ Contact **Occupational Health Officer** for advice:

Edel Niland 0863891080 (Mon – Fri 9:00am – 5:00pm)

Worrying

If the incident requires immediate medical attention:

- ✓ Arrange transport for the staff/student to their **local GP** or **A&E Department.**
    - Nearest A&E is **Mater Hospital – Tel: (01) 803 2488**
- ✓ Sick/unwell/injured students can attend the **Student Health Centre** on City Campus
    - **Rathdown House** – **Tel: (01) 220 5700** (Mon – Fri 9.00am – 5.00pm)
- ✓ For urgent out of hours GP service in the North Dublin area
    - **DDOC – Tel: 0818 224 476** (Weekdays, Monday to Thursday 6pm to 8am. Weekends, 6pm Friday to 8am Monday. All day on Bank Holidays.)
- ✓ If there is any doubt about the severity of the injury/illness:
    - Contact **Emergency Services** on **112 or 999.**
- ✓ A friend/responsible person should accompany staff member/student to hospital.

Serious

- ✓ Contact **Emergency Services** immediately at **112 or 999.**
- ✓ Stay with the casualty: do not move them unnecessarily and reassure the casualty.
- ✓ Contact **First Aider.**
- ✓ Keep the person comfortable until the ambulance arrives.
- ✓ A friend/responsible person should accompany staff member/student to hospital.

REMEMBER:

1) If there is any doubt regarding the severity of an injury/illness, contact the emergency services -112 or 999.
2) A first aid kit, AED and incident report book are available at Porter's desk.

3) Once immediate first-aid treatment has been given, and an ambulance may not be necessary, but a visit to A&E/doctor is advisable: send the injured person in a taxi accompanied by a friend/responsible person.
4) First Aider shall ASAP inform the person's supervisor & OHO of the action taken.
5) Complete Incident Report Form ASAP and forwarded to the Health and Safety Office.

18.4. Appendix 4 – Chemical Incompatibilities (Guidelines)

Acid + Alkali = Heat

Acid + Hypochlorite = Toxic Gas

Acid + Metal = Toxic Gas/Flammable Gas

Acid + Cyanide/Sulphide = Toxic Gas

Oxidising Agent + Organic Solvent = Fire

Reducing Agent + Organic Solvent = Fire

Water Reactive + most things = Fire

Violent reactions may occur when the following chemical agents are mixed:

Corrosives + Flammables = Explosion/Fire

Corrosives + Poisons = Poison Gas

Flammables + Oxidisers = Explosion/Fire

Acids + Bases = Corrosive Fumes/Heat

Substances on the left-hand column should be stored and handled so they cannot accidentally contact corresponding substances in the right column under uncontrolled conditions, when violent reactions may occur.

Chemical	***Incompatibles***
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates.

Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury.
Acetone	Concentrated nitric and sulphuric acid mixtures.
Alkali and alkaline earth metals (such as powdered aluminium or magnesium, calcium, lithium, sodium, potassium).	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens.
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous).
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulphur, finely divided organic combustible materials.
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulphur, finely divided organic or combustible materials
Chromic acid and chromium	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general.
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine.
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulphide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens

Fluorine	All other chemical agents
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane combustible materials
Hydrogen sulphide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulphuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulphide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen: flammable liquids, solids or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulphuric and other acids
Potassium perchlorate (see also chlorates)	Sulphuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulphuric acid

Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium Nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulphides	Acids
Sulphuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents

Incompatibilities by Hazard Class

	Acids, inorganic	Acids, oxidizing	Acids, organic	Alkalis (bases)	Oxidizers	Poisons, inorganic	Poisons, organic	Water-reactives	Organic solvents
Acids, inorganic			X	X		X	X	X	X
Acids, oxidizing			X	X		X	X	X	X
Acids, organic	X	X		X	X	X	X	X	
Alkalis (bases)	X	X	X				X	X	X
Oxidizers			X				X	X	X
Poisons, inorganic	X	X	X				X	X	X
Poisons, organic	X	X	X	X	X	X			
Water-reactives	X	X	X	X	X	X			
Organic solvents	X	X		X	X	X			

18.5. Appendix 5 - Glove Selection

Glove Selection Guide		
Chemical	Recommended Gloves	Comments
Acetic acid	Nitrile, Neoprene	
Acetone	Latex, double glove	
Acetonitrile	Nitrile, double glove	
Acrylamide	Nitrile	
Ammonium Hydroxide	Nitrile	
Benzene	ChemTek, Viton, Silver Shield	
Butanol	Latex, Nitrile	
Buffers	Latex, Nitrile	
Carbon Disulfide	Nitrile	
Carbon Tetrachloride	ChemTek, Viton, Silver Shield	Probable Human Carcinogen.
Chemotherapy Drugs	Latex or Nitrile, double glove	
Chloroform	ChemTek, Viton, Silver Shield	
Cidex	Latex, Nitrile, Neoprene	
Clear Rite	Nitrile	
Cryogenic Liquids	Cryogenic Gloves	
Cyclohexane	Nitrile	
Dimethyl Formamide	Neoprene, Latex	
Dimethyl Sulfoxide	Nitrile	
1,4-Dioxane	Butyl, Silver Shield	Mutagen and probable carcinogen.
Ethanolamine	Nitrile	
Ethidium Bromide (10%)	Nitrile, Neoprene	
Ethyl Acetate	Latex, double glove	Butyl, Silver Shield are recommended for heavy use.
Ethanol	Nitrile, Neoprene	
Ethyl Ether	Nitrile	
Formaldehyde (37%)	Nitrile, Neoprene, Latex	
Formic Acid	Nitrile, Latex	
Glutaraldehyde (<5%)	Latex, Nitrile	
Guanidine Solutions	Latex, double glove	
Heptanes	Nitrile	
Hexane	Nitrile	
Hydrochloric acid	Nitrile, Neoprene, Latex	
Hydrogen peroxide (2 – 30%)	Nitrile, Neoprene	
Isopropanol (2-propanol)	Nitrile, Latex	
2-Mercaptoethanol	Nitrile	
Mercury, Inorganic	Nitrile, Latex	
Methanol	Nitrile, Neoprene	
Methylene Chloride	ChemTek, Viton, Silver Shield	Cal-OSHA regulated carcinogen.
Nitric Acid	Nitrile	
Osmium Tetroxide	Nitrile, double glove	
Perchloric Acid (70%)	Nitrile	
Phenol	Nitrile, Neoprene	
Phenol/Chloroform/Amyl Alcohol	ChemTek, Viton, Silver Shield	
Phosphoric acid	Nitrile, Latex	
Sodium Hydroxide	Nitrile, Neoprene, Latex	
Sulfuric Acid (50%)	Nitrile, Latex	
Sulfuric Acid (98%)	ChemTek, Butyl, Silver Shield	
TEMED	Nitrile, double glove	
Tetrahydrofuran	Silver Shield, ChemTek	
Trichloroacetic Acid	Nitrile, Viton	
Trifluoroacetic Acid	Neoprene, Silver Shield	
Xylene	Nitrile, double glove	ChemTek, Silver Shield recommended for heavy use.

Ansell 8 mil ChemTek gloves are available from Fisher Safety at www.fishersafety.com. Nitrile, latex, neoprene, butyl, and North Safety Silver Sheild/4H gloves are available from Fisher Scientific at www.fishersci.com and VWR at www.vwr.com

Glove recommendations are based on information from the glove manufacturers Ansell Healthcare, Best Manufacturing, North Safety, and Kimberley Clark, and on the *Quick Selection Guide to Chemical Protective Clothing, 5th Edition.*