Technological University Dublin
Ollscoil Teicneolaiochta Bhaile Atha Cliath

Department of Applied Science

ANCILLARY SAFETY STATEMENT

Revision 9

2019

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Glossary of abbreviations used:

PPE	Personal Protective Equipment
MSDS	Materials Data Safety Sheet
RSP.	Risk and Safety Phrases
CGC.	Compressed Gas Cylinders
CASH.	Center for Applied Science and Health

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1.0 Departmental Statement on Safety.

It is a prime objective of the Department of Applied Science to achieve and sustain high standards of Health and Safety in so far as is reasonably practicable. This means at a minimum to conform to the requirements of Irish legislation as it pertains to Occupational Health and Safety.

It is the Department's desire to do all that is reasonably practicable to prevent damage to property and injury from foreseeable work Hazards.

In particular the Department recognizes its responsibility and commits itself to:

- Provide and maintain safe and healthy working conditions, for both students and staff members, taking account of statutory requirements;
- Provide training and instruction, where necessary, to enable staff to perform their work safely and effectively;
- Make available all necessary safety devices and protective equipment and supervise their use;
- Maintain a constant and continuing interest in health and safety matters pertinent to the Science Department;
- Keep this Safety Statement and other safety documents under review.

2.0 General and Specific Duties of Staff.

- Safe procedures cannot be implemented without the co-operation of all staff and it is a requirement of all those working in the department of Science to read and abide by the guidelines as outlined in this safety statement.
- To take reasonable care to protect their own safety, health and welfare and that of visitors and any other persons who may be affected by their acts or omissions while at work.
- To co-operate in the wearing of the correct safety equipment, using the appropriate safety devices and following proper safe systems of work.
- To co-operate in the investigation of accidents and the reporting of them and also the reporting to their supervisors of any local hazards: of which they become aware.
- To promote ideas on the improvement of health and safety standards and to make suitable suggestions for reduction in risks.
- Not to interfere with or misuse any specified items of safety equipment or any safety device.
- To ensure that all working areas are kept clean and tidy, and that high standards of housekeeping and hygiene maintained.
- All staff must wear appropriate protective equipment when entering a hazardous area.
- All staff must report any defects in plant or equipment.
- All staff must report any person abusing facilities and equipment.
- In the case of practical demonstrations and practical classes, the college takes the view while the student, whether full-time or part-time, is under the supervision of the staff member that the staff member in question is responsible for the safety and welfare of the student. In the instance where there may exist more than one staff member present at student practicals, in a supervisory capacity, the primary responsibility for safety in the laboratory situation rests with the main or lead supervisor.
- When new equipment / materials are brought in, the staff member responsible must provide details on the Hazards: and Hazards: required to the Safety Committee for inclusion in the safety statement. A risk assessment must be carried out and made available for inspection.
- In the case of the laboratory work of postgraduate students, the safety of the student is the responsibility of the local academic staff supervisor. It is the view of the University that preparations, formulations, purification's, analyses, experimental procedures entered into by post graduate research students are sanctioned by the academic supervisor with due consideration being given to safety and welfare, and that all reasonably practicable measures to both minimize and eliminate Hazards: and protect staff are taken.
- Staff should consult Material Safety Data Sheets (MSDS) of all chemicals used in their laboratories (http://www.sigmaaldrich.com/safety-center.html) as well as the various statutory instruments

associated with the classification, packaging, and labeling of chemicals, Risk and Safety Phrases (RSP), and data sheets relating to microbial organisms.

- The safety statement will be updated as necessary in light of new legislation. Procedures may change to suit different work practices and our safety policy must be flexible enough to take account of these changes. Indeed it is the intention of the Institute that this document should not be seen as a final statement on safety but rather should be read with a critical eye by all members of TU Dublin, Tallaght Campus. You are encouraged to provide feedback to the University on any aspect of this document and to suggest additions/amendments as appropriate.

3.0 Statement on Safety, Health and Welfare at Work Policy.

The purpose of the Safety, Health and Welfare at Work Act 2005, is to ensure the safety, health and welfare of all employees in the workplace and to ensure that non-employees present in the workplace are safe. Staff are requested to read the Safety, Health and Welfare at Work Act 2005 (http://www.oireachtas.ie/documents/bills28/acts/2005/a1005.pdf).

The Act applies to employees in all types of work and embraces all the activities of TU Dublin, Tallaght Campus. Attention is drawn particularly to Chapter 2 Section 13 and 14 of this Act.

3.1 The general duties of employees, as outlined in the Act, are as follows:

Section 13(1) an employee shall, while at work—

(*a*) comply with the relevant statutory provisions, as appropriate, and take reasonable care to protect his or her safety, health and welfare and the safety, health and welfare of any other person who may be affected by the employee's acts or omissions at work,

(*b*) ensure that he or she is not under the influence of an intoxicant to the extent that he or she is in such a state as to endanger his or her own safety, health or welfare at work or that of any other person,

(*c*) If reasonably required by his or her employer, submit to any appropriate, reasonable and proportionate tests for intoxicants by, or under the supervision of, a registered medical practitioner who is a competent person, as may be prescribed,

(*d*) Co-operate with his or her employer or any other person so far as is necessary to enable his or her employer or the other person to comply with the relevant statutory provisions, as appropriate,

(*e*) Not engage in improper conduct or other behaviour that is likely to endanger his or her own safety, health and welfare at work or that of any other person,

(*f*) attend such training and, as appropriate, undergo such assessment as may reasonably be required by his or her employer or as may be prescribed relating to safety, health and welfare at work or relating to the work carried out by the employee,

(*g*) having regard to his or her training and the instructions given by his or her employer, make correct use of any article or substance provided for use by the employee at work or for the protection of his or her safety, health and welfare at work, including protective clothing or equipment,

(*h*) Report to his or her employer or to any other appropriate person, as soon as practicable—

(i) any work being carried on, or likely to be carried on, in a manner which may endanger the safety, health or welfare at work of the employee or that of any other person,

(ii) any defect in the place of work, the systems of work, any article or substance which might endanger the safety, health or welfare at work of the employee or that of any other person, or

(iii) any contravention of the relevant statutory provisions which may endanger the safety, health and welfare at work of the employee or that of any other person, of which he or she is aware.

(2) An employee shall not, on entering into a contract of employment, misrepresent himself or herself to an employer with regard to the level of training as may be prescribed under *subsection (1)(f).*

Section 14. A person shall not intentionally, recklessly or without reasonable cause—

(*a*) Interfere with, misuse or damage anything provided under the relevant statutory provisions or otherwise for securing the safety, health and welfare of persons at work, or

(*b*) Place at risk the safety, health or welfare of persons in connection with work activities.

3.2 The general duties of TU Dublin, Tallaght Campus, as outlined in the Act, are as follows:

The policy of the University is, in so far as is reasonably practicable, to ensure the safety, health and welfare at work of all employees and further to ensure that persons not in the University's employment, who may be affected by the work activities are not exposed to risks to their safety and health. In particular the University recognises its express responsibilities under Section 8 of the Act. The employer's duties as set out in Section 8 of the Act are as follows:

Section 8.

1. Every employer shall ensure, so far as is reasonably practicable, the safety, health and welfare at work of his or her employees.

2. Without prejudice to the generality of subsection (1), the employer's duty extends, in particular, to the following:

   (a) Managing and conducting work activities in such a way as to ensure, so far as is reasonably practicable, the safety, health and welfare at work of his or her employees;

   (b) managing and conducting work activities in such a way as to prevent, so far as is reasonably practicable, any improper conduct or behaviour likely to put the safety, health or welfare at work of his or her employees at risk;

   (c) as regards the place of work concerned, ensuring, so far as is reasonably practicable—
      (i) the design, provision and maintenance of it in a condition that is safe and without risk to health,
      (ii) the design, provision and maintenance of safe means of access to and egress from it, and
      (iii) the design, provision and maintenance of plant and machinery or any other articles that are safe and without risk to health;

   (d) ensuring, so far as it is reasonably practicable, the safety and the prevention of risk to health at work of his or her employees relating to the use of any article or substance or the exposure to noise, vibration or ionising or other radiations or any other physical agent;

   (e) providing systems of work that are planned, organised, performed, maintained and revised as appropriate so as to be, so far as is reasonably practicable, safe and without risk to health;

   (f) providing and maintaining facilities and arrangements for the welfare of his or her employees at work;

(g) providing the information, instruction, training and supervision necessary to ensure, so far as is reasonably practicable, the safety, health, and welfare at work of his or her employees;

(h) determining and implementing the safety, health and welfare measures necessary for the protection of the safety, health and welfare of his or her employees when identifying Hazards: and carrying out a risk assessment under section 19 or when preparing a safety statement under section 20 and ensuring that the measures take account of changing circumstances and the general principles of prevention specified in Schedule 3;

(i) having regard to the general principles of prevention in Schedule 3, where risks cannot be eliminated or adequately controlled or in such circumstances as may be prescribed, providing and maintaining such suitable protective clothing and equipment as is necessary to ensure, so far as is reasonably practicable, the safety, health and welfare at work of his or her employees;

(j) preparing and revising, as appropriate, adequate plans and procedures to be followed and measures to be taken in the case of an emergency or serious and imminent danger;

(k) reporting accidents and dangerous occurrences, as may be prescribed, to the Authority or to a person prescribed under section 33, as appropriate, and

(l) obtaining, where necessary, the services of a competent person (whether under a contract of employment or otherwise) for the purpose of ensuring, so far as is reasonably practicable, the safety, health and welfare at work of his or her employee

3.1 Table 1 – Work practice Sheets

Ref	Area	Hazard / Consequence	Control	Risk Eval	Date Identified	Action Person	Date Rectified
5	All science Labs	**Lab. Safety:**	Workpractice sheet	Medium	19th May 16	HOD	
		Inexperience					
		Chemical& Biological agents					
		Unfamiliar Equipment					
6	All science Labs	**General Lab. Housekeeping:**	Workpractice sheet	Medium	19th May 16	HOD	
		Trips, slips falls					
		Collisions					
		Falling Objects					
		Fire					
		Cuts					
		Contamination					
7	All science Labs	**Manual Handling:**	Workpractice sheet	High	19th May 16	HOD	
		Incorrect method of lifting, pushing, pulling or carrying					
8	All science Labs	**Pregnant Employees:**	Workpractice sheet	Medium	19th May 16	HOD	
		Physical shocks					
		Handling Loads					
		Noise					
		Excessive Heat & Cold					
		Ionising & Non Ionising radiation					
		Chemical Safety					
12	All science Labs	**Lone Working:**	Workpractice sheet	Medium	19th May 16	HOD	
		Suffering an accident					
		Falling ill					
		Attack by another person					
		Unforeseen lab incident					
15	All science Labs	**Liquid N_2, Liquid He, & Dry Ice:**	Workpractice sheet	Medium	19th May 16	HOD	
		Freeze burn					
		Frostbite					
		Tissue Loss					
		Asphyxiation					
		Manual Handling					
16	All science Labs	**Compressed Gases**	Workpractice sheet	Medium	19th May 16	HOD	
		Fire					
		Explosion					
		Asphyxiation					

		Release of toxic chemical gas					
19	All science Labs	**Chemical Safety**	Workpractice sheet	Depends on the chemical agent	19th May 16	HOD	
		Skin contact & absorption					
		Inhalation of dust/volatile chemicals					
		Inhalation of solvent vapours					
		Accidental ingestion					
		Fire & explosion					
		Environmental effects					
20	All science Labs	**Waste Disposal**	Workpractice sheet			HOD	
		General waste		Low	23rd May 16		
		Solid,Bio-hazardous & Sharps Waste		High	23rd May 16		
21	All science Labs	**Electricity**	Workpractice sheet	High	23rd May 16	HOD	
		Electric Burns					
		electric shock					
		Fire					
		Trips / falls over loose cables					
22	All science Labs	**Fire**	Workpractice sheet	Medium	23rd May 16	HOD	
		Improperly Stored combustible/flammable materials					
		Use of naked flame					
		Faulty electrical equipment					
23	All science Labs	**Noise**	Workpractice sheet	Medium	23rd May 16	HOD	
		Lab equipment, sonicators, pumps etc					
		Use of radios in open plan labs					
24	Lab & lab office	**Office & VDU Safety**	Workpractice sheet	Low	23rd May 16	HOD	
		Poor arrangement of furniture,trips					
		sharp corners on furniture					
		High shelving					
		Falling Objects					
		Poor Lighting/ventilation					
		Bad workstation design					
		Glare/ flicker causing eye strain					
		Litter / flammable office waste					
25	Biology Lab	**Biological Agents**	Refer to Biosafety Manual				

26	Biology Lab & Pharma Plant	**Autoclaves**	Workpractice sheet	Mediu m	23rd May 16	HOD	
		Explosion					
		Hot pipe work					
		Contact with Steam					
		Burn risk when removing hot material					
		Biohazardous materials					
		Manual handling of hazardous,hot loads					
27	Chem & Biology labs	**Centrifuges**	Workpractice sheet	Mediu m	23rd May 16	HOD	
		Bodily injuries due to unbalanced centrifuges					
		Heavy rotors					
		Incorrectly secured lids					
28	Chem & Biology labs	**Fridges, freezers & cold rooms**	Workpractice sheet	Low	23rd May 16	HOD	
		Explosion					
		Fire					
		Hazardous Chemicals					
		Slips & Falls(cold rooms)					
29	Research (CASH)	**Confocal Microscope**	Refer to CASH Safety Statement			Ken Carroll	

4.0 General and Specific Duties and Responsibilities of Postgraduate and Undergraduate Students.

Students' responsibilities are in accordance with Section 14 of the Act which states;

1) A person shall not intentionally, recklessly or without reasonable cause—
    a. Interfere with, misuse or damage anything provided under the relevant statutory provisions or otherwise for securing the safety, health and welfare of persons at work, or
    b. Place at risk the safety, health or welfare of persons in connection with work activities.
2) Students must take reasonable care to protect his or her safety & the safety of any other person who may be affected by the student's acts or omissions.
3) Students must co-operate with staff in the wearing of the correct safety equipment, using the appropriate safety devices and following proper safe systems of work.
4) Undergraduate students are required to provide their own laboratory coats and other Personal Protective Equipment as deemed necessary.
5) Eating (including chewing gum) or drinking must not take place in the laboratory, nor should cosmetics or lip balm be applied. Contact with the facial area should be avoided. The only exception to this is any subject on an ergometer in the sports lab where they may have water or energy bar.
6) Long hair should be tied back to avoid contact with specimens, equipment or Bunsen burners.
7) Open toed shoes, sandals and bare legs should be avoided when working with chemicals.
8) Undergraduate students are required to read and understand the lab safety guidelines prior to commencing work in the lab.
9) All students must have access to Material Safety Data Sheets (MSDS) of all chemicals used during laboratory practicals.
10) Students must co-operate in the investigation of accidents and the reporting of them and also the reporting to their supervisors of any local Hazards: of which they become aware.
11) All students will be encouraged to promote ideas on the improvement of health and safety standards and to make suitable suggestions for reduction in risks.
12) Students must not interfere with or misuse any specified items of safety equipment or any safety device.
13) All working areas must be kept clean and tidy with high standards of housekeeping and hygiene maintained.
14) Students who fail to comply with safety procedures are subject to appropriate disciplinary action.

5.0 Laboratory Safety.

5.1 Undergraduate Practical Classes.

1) Academic staff responsible for each practical class should provide students and demonstrators with safety guidelines for each practical.
2) A written risk assessment should be carried out by the lead lecturer before bench work commences. A copy of the risk assessment should be given to the technicians at this time.
3) Brief safety notes should be provided which highlight any particular hazard the student is likely to encounter in each specific lab session.
4) Students should not be admitted to attend practical classes without Lab coat and safety glasses.
5) It is the responsibility of all teaching and technical staff present to ensure student compliance in the wearing of lab coats and safety glasses

5.2 Undergraduate Project Students

5.2.1 Hazard:

1) Inexperience – Students who are unused to working on their own individual project.
2) Chemical and biological agents.
3) Unfamiliar equipment.
4) Using procedures and techniques that to date would have been performed by demonstrators or technicians

Risk Assessment	Medium

5.2.2 Control Measures:

1) A written risk assessment should be carried out before bench work commences on all undergraduate projects. This may be done as part of the initial literature survey.
2) Students should submit a copy of their risk assessment to the technicians at this time.
3) All experiments, and any risk assessments carried out on them, must be vetted in advance, ensuring that the safest methods are employed. The safety of projects must be reassessed when changes or additions are made.
4) There must be strict supervision of all 4^{th} year students in all labs by both academic staff and postgraduate students.
5) 4^{th} year students must be advised about the Hazards: of the agents they are using. The technicians, academic supervisors and research students around should be made aware of the chemicals, cultures and techniques to be used by the project students in their vicinity.
6) All project students and supervisors must wear a white coat and safety glasses while doing work in the chemical laboratories. They must wear protective gloves as appropriate, and change them regularly to prevent contamination.
7) Students should not use any equipment until they receive proper training in its safe use. They should be made familiar with proper laboratory techniques and the possible associated risks.
8) Work should be done on the smallest possible scale, to reduce exposure.

9) Where appropriate, work should be done in a fume hood, tissue culture cabinet or other restricted area.
10) Good laboratory practices and housekeeping should be maintained to prevent unnecessary contamination and exposures.
11) Lone working should not be permitted for any undergraduate project students, unless there is written consent given by the HOD.
12) Other relevant sections of the Safety Statement should also be consulted.
13) No eating or drinking is allowed in the lab with the exception of a subject on an ergometer (water or energy sustenance only).
14) Bags are not permitted in the lab as they present a trip hazard.
15) Some materials are locked away, e.g. toxic chemicals and oxidizers, students must be made aware that these chemicals have to be returned to the appropriate cabinets.
16) All containers must be clearly labelled with students name, contents and date.
17) Caps or lids on containers being put into the autoclave must be kept slightly loose.
18) Autoclave tape must be put onto anything that requires autoclaving in order to indicate its sterility status.
19) If unsure at all, project students should confirm with technical staff or supervisors, where chemicals / reagents are to be disposed of. This is also the case for broken glassware and whether it's chemically contaminated or clean.

5.3 General Laboratory Safety

1) Wear a clean white lab coat at all times in the lab, to protect you and your clothing from contamination and spillage's. The lab coat should be Howie style with elasticated cuffs and snap-fasteners up to the neck.
2) Safety Glasses or over glasses with side protection must be worn.
3) Keep all unnecessary items, such as coats and bags out of the lab and off lab benches.
4) Eating, drinking and smoking are strictly forbidden. Do not place anything in your mouth while in the lab. Generally avoid any contact with the facial region.
5) Disposable gloves are provided and should be worn during the practical. Cuts should be covered with waterproof dressings. Gloves may become contaminated with potentially hazardous chemicals or biological materials during routine practical procedures, if so they should be removed immediately to the appropriate waste bin and replaced with clean gloves. This will prevent spreading the contaminant to yourself, your experiment and to lab equipment.
6) Disposable face-masks should be used only once and discarded. They should be placed over the mouth and nose, never leave a used mask around your neck or head.
7) Always use pipetting aids when measuring liquids in pipettes.

8) Never taste chemicals.
9) Undergraduate students are only permitted to work in the lab during the authorised time period and never alone.
10) Do not leave boiling solutions unattended, remove from the source of heat to a safe place and leave a caution notice.
11) Work in a safety conscious manner. Keep your work areas as clean and tidy as is practicable. Good housekeeping is a vital element of good lab practice. Ensure that your work area is left clear at the end of each practical.
12) Students should familiarise themselves with the different types of solid or liquid waste bins provided and segregate their waste accordingly:

    a. General uncontaminated waste
    b. Sharps Waste
    c. Contaminated glass waste
    d. Biological Waste
    e. Chemical Waste - Non-chlorinated Organic
        - Gram Stain
        - Aqueous Inorganic
        - Chlorinated Organic
        - Phenol
        - Mercaptoethanol
        - Solid Waste

13) Never use an item of equipment before receiving instruction in its use and being aware of the Hazards: involved. Observe any specific notices attached to individual pieces of equipment.
14) In the event of a fault with electrical or electronic equipment, contact your demonstrator or technician. Do not attempt to use or repair faulty equipment yourself.
15) Any student failing to follow safe practices in the lab will be asked to leave and present themselves to the Head of Department.
16) Always wash your hands immediately after lab work, and if you leave the lab for coffee etc. Never wear your lab coat outside of the lab.

5.4 Handling Laboratory Reagents Safely

1) All lab chemicals, microorganisms and biological samples should be treated as potentially hazardous and appropriate care must be taken at all times.

2) Avoid all naked flames when handling flammable materials.
3) Students should familiarise themselves with the MSDS of chemicals they are about to use and with safety labels and signs appearing on all chemicals.
4) If in doubt about the safe handling of any chemical or biological sample the student should assume a material is hazardous and seek advice from a lab demonstrator.
5) All chemicals and reagents prepared in the lab must be clearly labelled with;
    1) type of reagent
    2) concentration
    3) date of preparation
    4) Student's initials.
6) When adding chemicals to test tubes or boiling solutions in test tubes, ensure that the open end of the test tube is not pointing at anyone.
7) All culture vessels, petri dishes containing cultures etc., must be labelled with the organism name, the date, the culture medium and your initials
8) All test tubes containing cultures must be kept upright in the test tube racks provided.
9) Microbial cultures and preparations must not be removed from the lab.
10) Ensure that chemical spills are cleaned up immediately and appropriately. In the event of spillage of a culture, cover the area immediately with disinfectant and notify the demonstrator in charge of your practical class.

5.5 Accidents or Breakages in the Laboratory

1) Any personal accidents, breakages to equipment, or spillages of reagents must be reported immediately to the demonstrator in charge of your practical class.
2) Be aware of the locations of the first aid kit, eye wash stations and fire exits.
3) If a reagent splashes onto your skin immediately inform the demonstrator / technician.
4) Broken glassware must be disposed of in the appropriate sharps containers provided.
5) Waste chemicals must be carefully disposed of in the appropriate containers provided in the lab. If unsure ask for advice from the demonstrator / technician
6) Items contaminated with biological material, microbial cultures etc., must be disposed of in the biological waste bin and subsequently autoclaved.
7) All accidents involving injury to persons, damage to property or any near miss that almost resulted in either must be reported to the technician and an Accident and Incident Report Form filled out by the demonstrator.

5.6 Glove Usage

Glove selection is the responsibility of the lead lecturer running the Laboratory session

1) You must wear the correct gloves when required

2) You must not wear gloves longer than three hours
3) You must wash your hands once the gloves have been removed
4) Disposable gloves must be discarded once removed, do not save for future use
5) You must dispose of gloves in the proper container
6) You must remove gloves before touching personal items, such as phones, computers, pens and ones skin. Remember the designated area rule, where “science” does not mix with personal space (ones desk or lunch space). Gloves used in research are considered “Science”.
7) Do not wear gloves out of the lab. If gloves are needed to transport anything, wear one glove to handle the transported item. The free hand is then used to open doors, elevators, etc.
8) If for any reason a glove fails and chemicals come into contact with the skin, consider it an exposure and seek medical attention.

5.6.1 Glove Selection for Laboratories

Consider:

1) The nature of the chemicals to which exposure might occur
2) The concentration and/or temperature of the chemicals both of which can affect penetration rates
3) The frequency and duration of contact with the chemical
4) The requirement for the glove material to be robust and resistant to physical damage such as tearing or abrasion.
5) The need for dexterity and "feel" with the glove on
6) The extent of protection - hand and wrist.
7) At the same time, gloves should not be used as a substitute for good experimental procedure which, as far as is practicable, should keep contamination well clear of all skin contact including hands.
8) When selecting the appropriate glove, the following characteristics should be considered:
   - Degradation rating
   - Breakthrough time
   - Permeation rate

5.6.1.1 Degradation is the change in one or more of the physical properties of a glove caused by contact with a chemical. Degradation typically appears as hardening, stiffening, swelling, shrinking or cracking of the glove. Degradation ratings indicate how well a glove will hold up when exposed to a chemical.

When looking at a chemical compatibility chart, degradation is usually reported as

- E (excellent)
- G (good)
- F (fair)
- P (poor)

- NR (not recommended)
- NT (not tested)

5.6.1.2 Breakthrough time is the elapsed time between the initial contact of the test chemical on the surface of the glove and the analytical detection of the chemical on the inside of the glove.

5.6.1.3 Permeation rate is the rate at which the test chemical passes through the glove material once breakthrough has occurred and equilibrium is reached. Permeation involves absorption of the chemical on the surface of the glove, diffusion through the glove, and desorption of the chemical on the inside of the glove.

Resistance to permeation rate is usually reported as

- E (excellent)
- G (good)
- F (fair)
- P (poor)
- NR (not recommended)

If chemical breakthrough does not occur, then permeation rate is not measured and is reported ND (none detected).

Manufacturers stress that permeation and degradation tests are done under laboratory test conditions, which can vary significantly from actual conditions in the work environment. Users may opt to conduct their own tests, particularly when working with highly toxic materials. For mixtures, it is recommended that the glove material be selected based on the shortest breakthrough time.

The following table includes major glove types and their general uses. This list is not exhaustive.

Glove Material	General Uses
Butyl	Offers the highest resistance to permeation by most gases and water vapor. Especially suitable for use with esters and ketones.

Neoprene	Provides moderate abrasion resistance but good tensile strength and heat resistance. Compatible with many acids, caustics and oils.
Nitrile	Excellent general duty glove. Provides protection from a wide variety of solvents, oils, petroleum products and some corrosives. Excellent resistance to cuts, snags, punctures and abrasions.
PVC	Provides excellent abrasion resistance and protection from most fats, acids, and petroleum hydrocarbons.
PVA	Highly impermeable to gases. Excellent protection from aromatic and chlorinated solvents. Cannot be used in water or water-based solutions.
Viton	Exceptional resistance to chlorinated and aromatic solvents. Good resistance to cuts and abrasions.
Silver Shield	Resists a wide variety of toxic and hazardous chemicals. Provides the highest level of overall chemical resistance.
Natural rubber	Provides flexibility and resistance to a wide variety of acids, caustics, salts, detergents and alcohols.

Table 2

5.6.1.4 Where to Find Compatibility Information

1) Most glove manufacturers have chemical compatibility charts available for their gloves.
2) Most material safety data sheets (MSDS) recommend the most protective glove material in their Protective Equipment section.
3) There are MSD Sheets for laboratory chemicals available on the web.

5.6.1.5 Other Considerations

There are several factors besides glove material to consider when selecting the appropriate glove.

The amount of *dexterity* needed to perform a particular manipulation must be weighed against the glove material recommended for maximum chemical resistance. In some cases, particularly when working with delicate objects where fine dexterity is crucial, a bulky glove may actually be more of a hazard.

Where fine dexterity is needed, consider double gloving with a less compatible material, immediately removing and replacing the outer glove if there are any signs of contamination. Glove thickness, usually measured in mils or gauge, is another consideration. A 10-gauge glove is equivalent to 10 mils or 0.01 inches. Thinner, lighter gloves offer better touch sensitivity and flexibility, but may provide shorter breakthrough times. Generally, doubling the thickness of the glove quadruples the breakthrough time.

Glove *length* should be chosen based on the depth to which the arm will be immersed or where chemical splash is likely. Gloves longer than 14 inches provide extra protection against splash or immersion. Glove *size* may also be important. One size does not fit all. Gloves which are too tight tend to cause fatigue, while gloves which are too loose will have loose finger ends which make work more difficult. The circumference of the hand, measured in inches, is roughly equivalent to the reported glove size. Glove colour, cuff design, and lining should also be considered for some tasks.

5.6.1.6 Glove Inspection, Use and Care

1) All gloves should be inspected for signs of degradation or puncture before use.
2) Test for pinholes by blowing or trapping air inside and rolling them out.
3) Do not fill them with water, as this makes the gloves uncomfortable and may make it more difficult to detect a leak when wearing the glove.
4) Disposable gloves should be changed when there is any sign of contamination.
5) While wearing gloves, be careful not to handle anything but the materials involved in the procedure. Touching equipment, phones, wastebaskets or other surfaces may cause contamination.
6) Be aware of touching the face, hair, and clothing.
7) To avoid accidental skin exposure, remove the first glove by grasping the cuff and peeling the glove off the hand so that the glove is inside out. Repeat this process with the second hand, touching the inside of the glove cuff, rather than the outside.
8) Wash hands immediately with soap and water.

5.6.1.7 Proper Glove Removal

Gloves should be removed avoiding skin contact with the exterior of the glove and possible contamination.

Disposable gloves should be removed as follows:

1) Grasp the exterior of one glove with your other gloved hand.
2) Carefully pull the glove off your hand, turning it inside-out - The contamination is now on the inside.
3) Ball the glove up and hold in your other gloved hand.
4) Slide your ungloved finger into the opening of the other glove - Avoid touching the exterior.
5) Carefully pull the glove off your hand, turning it inside out again - All contamination is contained.
6) Discard appropriately.

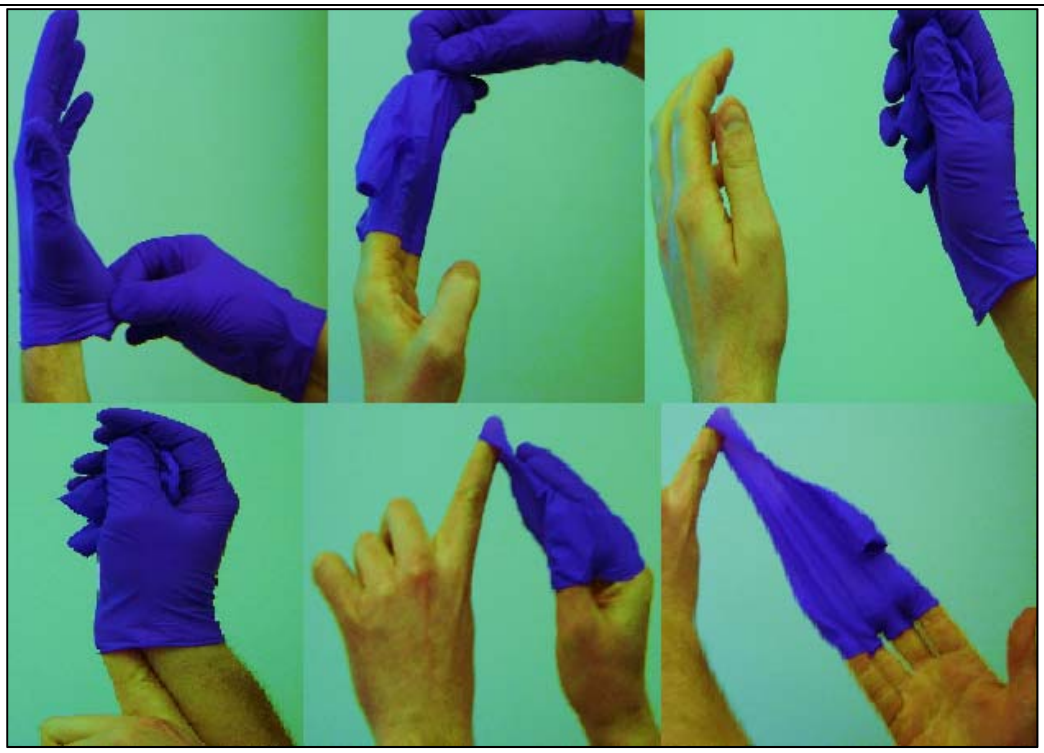

Image 1.0 Glove removal technique.

5.6.1.8 Latex Gloves and Related Allergies

Allergic reactions to natural rubber latex have been increasing since 1987, when the Centres for Disease Control recommended the use of universal precautions to protect against potentially infectious materials, blood borne pathogens and HIV. Increased glove demand also resulted in higher levels of allergens due to changes in the manufacturing process. In addition to skin contact with the latex allergens, inhalation is another potential route of exposure. Latex proteins may be released into the air along with the powders used to lubricate the interior of the glove.

In June, 1997, the National Institute of Occupational Safety and Health (NIOSH) issued an alert *Preventing Allergic Reactions to Latex in the Workplace* (publication number DHHS (NIOSH) 97-135).

Latex exposure symptoms include skin rash and inflammation, respiratory irritation, asthma and shock. The amount of exposure needed to sensitize an individual to natural rubber latex is not known, but when exposures are reduced, sensitization decreases.

NIOSH recommends the following actions to reduce exposure to latex:

1) Whenever possible, substitute another glove material.
2) If latex gloves must be used, choose reduced-protein, powder-free latex gloves.
3) Wash hands with mild soap and water after removing latex gloves.

6.0 General Laboratory Housekeeping.

6.1 Hazards

1) Trips: Materials left lying in aisles
2) Slips: On floors with chemical spills, slippery material strewn about
3) Falls: Use of inappropriate materials for accessing higher work areas
4) Collisions: Blockage of access aisles with materials
5) Falling Objects: Improper stacking of materials
6) Fire: Inadequately and infrequent disposal of combustible rubbish
7) Cuts: Broken glass or sharp edges can cause cuts
8) Contamination: Biohazard laboratory waste can contaminate and cause infection

Risk Assessment	Medium

6.2 Control Measures

1) All areas shall be kept clean and tidy at all times. This is particularly important in all areas of common use.
2) All corridors shall be dry and free from obstruction at all times. Where floors are wet as a result of cleaning operations, warning signs should be erected to that effect and removed when cleaning is complete.
3) All spillages shall be cleaned up immediately.
4) All workplaces, passageways and stairs should be adequately lit. Defects in flooring, stair treads, handrails and lighting must be reported immediately to the technicians, Head of Department and/or Building Services.
5) All light fittings, windows will be regularly cleaned and broken light bulbs replaced. Used light bulbs should be appropriately disposed of.
6) All refuse bins shall be emptied as frequently as necessary to prevent build up of waste.
7) All waste shall be properly cleared away daily
8) Specialised waste bins (sharps, biohazard etc.) shall be handled with care and the relevant PPE should be worn at all times when handling waste.
9) The liquid chemical waste containers should be emptied regularly to prevent overflow and spillage. The appropriate battery powered respirators must be used when emptying the waste containers into the IBC's in the external Science Yard.
10) When using any cleaning materials, which may pose a hazard, protective clothing shall be supplied and used e.g. gloves.
11) Storage and stacking of goods must be done in specifically designated places and located in such a manner as to minimise the Hazards: of goods falling.

12) Goods should not be placed in overhead locations, such as on top of presses and ledges over doors where they can fall and strike persons below.
13) Office equipment and the surrounding area should be kept clean and tidy.
14) Any signs of vermin (droppings, actual sightings etc) shall be reported at once to Building Services.

Governing Legislation:
Safety Health and Welfare at Work Act 2005.
Safety Health and Welfare at Work (General Application) Regulations 2007 Part 2, Chapter 1 – Workplace.

7.0 Manual Handling.

7.1 Hazards

1) Incorrect method of lifting, pushing, pulling or carrying
2) Attempting to lift something which is too heavy
3) Lifting sharp/awkward shapes
4) Lifting material contaminated with harmful chemicals or biological material
5) The main injuries associated with manual handling and lifting are:
6) Back strain, slipped disc.
7) Hernias.
8) Lacerations, crushing of hands or fingers.
9) Repetitive Strain Injury.
10) Bruised or broken toes or feet.
11) Various sprains, strains, etc.
12) Biological or chemical contamination.

Risk Assessment	High

7.2 Control Measures:

1) Measures shall be taken to reduce the amount of manual handling to a minimum and mechanical handling devices supplied and used in so far as is reasonably practicable.
2) Mobile trolleys shall be used wherever practicable for transporting goods.
3) All appropriate staff shall be trained in safe manual handling techniques. Training will be organised in conjunction with the University HR Office and are coordinated when there is sufficient demand.
4) If a member of staff is involved in moving specific items e.g. gas cylinders, then these details should be given to the manual handling specialist and particular attention will be focused on these aspects during training.

5) Loads which must be manually handled shall be assessed on the basis of their risk to health and safety and due caution exercised where there is a risk of back injury etc. The method of handling shall take account of the size, weight, shape, condition and position of the load to be handled.
6) Staff should make themselves aware of the weight of the load to be moved.
7) Non-slip mats on floor surfaces shall be supplied on areas where there is a particular risk of slipping.
8) Portable step platforms shall be supplied and used to access loads at high levels.
9) Adequate lighting shall be supplied to ensure that visibility is sufficient at all times.

Governing Legislation:
Safety Health and Welfare at Work Act 2005.
Safety Health and Welfare at Work (General Application) Regulations 2007, Part 2, Chapter 4 – Manual Handling of Loads.

8.0 Pregnant Employees.

8.1 Hazards

1) Physical shocks, including direct blows to the abdomen
2) Handling loads, Ref Section 7.0 – Manual Handling
3) Noise, Ref. Section 23.0
4) Excessive heat and cold
5) Movement and postures which are abrupt or severe or give rise to excessive fatigue
6) Ionising radiation and non-ionising radiation
7) See Laboratory Biosafety manual
8) See Section 19.0 sub section 19.5 – Chemical Safety, including carcinogens, mutagens, teratogens, mercury and cytotoxic drugs.

Risk Assessment	Medium

8.2 Control Measures

On receiving notification that an employee is pregnant the specific risks to that employee must be assessed and action must be taken to ensure that she is not exposed to anything in the workplace that may damage either her safety or health of her developing child. To do this assessment, the type, quantity and duration of exposure to any agent, process or working condition must be identified.

1) The risk assessment (in writing) must be carried out specifically on the work done by the pregnant employee and must take into account her work environment.
2) If the assessment reveals that there is a risk to the pregnant woman she must be informed about the risk and what will be done to ensure her safety.

3) The supervisor must assess if there are any practical ways the risk can be avoided (by adjusting the working conditions, hours of work or by providing suitable alternative work)
4) Regulations are applicable as soon as the employee notifies TUDublin, Tallaght Campus or her Head of Department that she is pregnant, has recently given birth or is breastfeeding.
5) Any reference to a pregnant woman in this safety statement will include women during pregnancy, immediately after pregnancy and while breastfeeding, in accordance with the regulations.

Governing Legislation:
The Safety Health and Welfare at Work Act 2005.
Safety Health and Welfare at Work (General Application) Regulations 2007, Chapter 2, Part 6 – Protection of Pregnant, Post Natal and Breastfeeding Employees.
Maternity Protection Act 1994. Maternity Protection (Amendment) Act 2004. Various regulations made under the Maternity Protection Act. The Safety Health and Welfare at Work (Carcinogens) Regulations, 2001. The Safety Health and Welfare at Work (Biological Agents) Regulations, 1994. The Safety Health and Welfare at Work (Biological Agents) (Amendment) Regulations, 1998. Chemicals Act 2008.

9.0 Training.

The University recognises that the provision of relevant training and instruction by competent trainers is an important tool in the control of risks within the University.

All staff employed by the Science Department will receive induction training to ensure that they fully understand the Hazards to which they may be exposed and the safety precautions and emergency procedures required.

9.1 Objective.

The objective of safety training is to "help people to acquire the skills, knowledge and attitudes to make them competent in the health and safety aspects of their job". Health and safety training in the University is designed to encompass the legal requirement of:

a) eliminating the risks as far as possible that may exist for the safety, health and welfare of all persons employed by the University or by third parties, and where these risks cannot be eliminated to minimise them;
b) complying with all relevant statutory safety requirements regulating the work activities executed from time to time and;
c) providing information on Hazards:, risks, controls/arrangements and emergency procedure

Also as specifically set out in the Act, in assigning an employee to a specific task, the University must take account of the employee's capabilities including any special needs requirements in relation to safety, health and welfare. Employees must not be put at risk by being given work that they do not have the competence to undertake. Therefore, the provision of appropriate training and instruction is an important element in the management of safety and a legal requirement in controlling many of the risks identified in the University i.e.

the implementation of the safety statement. Training and instruction also serve to improve safety awareness and attitudes that are essential for effective safety management.

In addition to its statutory duty to employees as outlined above, the University also has a common law duty to all undergraduate and postgraduate students to provide such training as is necessary to enable the students to undertake their studies in a manner which, in so far as it is reasonably practicable, is safe and does not give rise to risks to health or expose the individual student or other persons to unacceptable levels of risk. The provision and extent of any necessary training is dependent upon the nature of the academic discipline being pursued,

a) the experience and disposition of the students involved,
b) their familiarity with any equipment/substances to be utilised,
c) the environment/conditions where the activities may be discharged,
d) The extent to which supervision is necessary and available.

9.2 Responsibility

The Department in parenthesis (below) is responsible for delivery of initial and refresher courses. Where identified risks and Hazards: are local to an individual department, training is organised locally.

1) Science Ancillary Safety Statement (Science Department)
2) Waste Disposal Procedures (Science Department)
3) Fire Safety (Personnel Department)
4) Accident and Emergency Procedures (Personnel Department)
5) Safe Manual Handling (Personnel Department)
6) First Aid Training (Personnel Department)
7) CPR & Defibrillator Training (Personnel Department)

9.3 Safety Records

Any training provided will meet the requirements of appropriate legislation, standards or guidelines and will be given by qualified instructors. (Laboratory personnel or external training organizations as appropriate). Safety training records will be maintained by the Safety Officer and will contain the following information:

1) Date of instruction or exercise;
2) Duration;
3) Name of instructor;
4) Name of person receiving instruction; and,
5) Nature and content of instruction.

10.0 Student Access to Laboratories.

10.1 Undergraduate students

All undergraduate students must be supervised by a member of Academic Staff or a designated Science post-graduate student at all times while working in a teaching laboratory either for scheduled classes or for project work. No undergraduate should have access to the laboratories outside of normal working hours. Students working in science laboratories are required to wear laboratory coat and safety glasses at all time.

10.2 Postgraduate students and staff

Postgraduate students are to be encouraged to arrange their work times so that there is always one other student or staff member present in the same laboratory. It is recognized that on occasion, postgraduate students may be required to work in laboratories outside of normal work hours. This should be the exception rather than the rule. Additionally, on no account must a student or staff member carry out a potentially hazardous operation after normal working hours when access to emergency help is limited. It is the responsibility of supervisors to ensure that students are aware of these rules.

Where a student or staff member finds it necessary to work in the building on their own after normal working hours, they should:

I. complete in full the Out of Hours Access Request Form (see section 35.2 below) to inform Security and/or Caretaker Staff of the time, date, duration and location of the work to be carried out; and,

II. Refrain from carrying out hazardous operations.

11.0 Procedure to Access of Premises outside of Normal Working Hours.

Please note that normal official opening hours for the College are as follows:

Opening Hours				
During Semester	Monday	0800 Hrs	to	2200 Hrs
	Tuesday	0800 Hrs	to	2200 Hrs
	Wednesday	0800 Hrs	to	2200 Hrs
	Thursday	0800 Hrs	to	2200 Hrs
	Friday	0800 Hrs	to	1800 Hrs
	Saturday	0800 Hrs	to	1400 Hrs
Opening Hours				
Outside Semester (Summer and Easter Breaks)	Monday	0800 Hrs	to	1800 Hrs
	Tuesday	0800 Hrs	to	1800 Hrs
	Wednesday	0800 Hrs	to	1800 Hrs
	Thursday	0800 Hrs	to	1800 Hrs
	Friday	0800 Hrs	to	1800 Hrs
	Saturday	0800 Hrs	to	1400 Hrs

Table 3.0

1. A register of out-of-hours access must be maintained at the main Reception Desk so that outside normal hours, Security Personnel can at all times ascertain who is on the premises and in what locations. All staff and post-graduate students must sign in and out of this register.

2. Staff requiring access must book same in advance by contacting the Estates Manager or his Assistant by e-mail and should specify the area or areas of the building to which access is required, including dates and times. A copy of this e-mail should be retained for Security personnel.

3. Postgraduate Researchers carrying-out ‘experimental procedures’ will need to present a complete Out Of Hours Access Request Form available from their Supervisor or Head of Dept. Ref Appendix 3.0. This form must be signed off by their Supervisor or his / her nominees during periods of absences and the Estates Manager or his assistant. Please give as much prior notice as possible with a minimum of one day’s notice.

4. On arrival, the staff member or undergraduate student must present themselves to Security showing ID indicating the area or areas of the building to which access is required and how long they expect to be on the premises.

12.0 Lone Working.

Lone working implies persons working on their own and without close or direct supervision. The University strongly recommends that in the interest of health, safety and personal security, out of hours work should only be undertaken when absolutely necessary and no other alternatives are available.

12.1 Hazards

1) Suffering an accident.
2) Falling ill.
3) Attack by another person.
4) Coping with a laboratory incident.

Risk Assessment	Medium

12.2 Control Measures:

1) Unsupervised out-of-hours work by undergraduate students is strictly forbidden.
2) For post-graduate students an Out of Hours Access Request From must be completed by a supervisor or his / her nominees during periods of absences, the Estates Manager or his assistant. This form must be presented to security for admittance to the University along with identification.
3) A register of out-of-hours access must be maintained at the main Reception Desk. Both staff members and post-graduate students are required to sign in and out of this register.
4) There must be adequate access and egress.
5) A lone worker must not undertake any manual handling activity in relation to plant, goods and substances which may result in an injury.
6) The worker must not suffer from any medical condition that makes him or her unsuitable for lone working.
7) Suitable safe contact and security arrangements must be in place.
8) High risk activities must be avoided.
9) Staff and students alike are to be encouraged to arrange their work times so that there is always one other student or staff member present in the same laboratory. However, it's recognized that on occasion it's unavoidable having a lone worker in the laboratory outside of normal work hours.
10) As a safety precaution the college has purchased a number of GSM loan Paging Devices. It is strongly recommended in the interest of personal safety that if lone work must be carried out, the devices are utilised.
11) These devices will be distributed to the School offices and also held by Caretaking staff.
12) Training on the use of the units will be provided by Building Services.

12.3 GSM Lone paging devices, Instrument Details

Teltonika Handheld Tracker is a handheld terminal with GSM and GPS connectivity, which is able to get device coordinates and transfer them via GSM network.

1) No installation is required
2) Geo-Fence function allows to set restricted geographical area and device will send warning messages whenever the object crosses the zone (in or out)
3) Real-Time tracking from the Internet
4) Device works in Sleep, Logging and Alarm modes
5) Low battery notification by SMS
6) USB GSM Modem function
7) Man down function: movement sensor for fall detection and power saving
8) Alarm button for data and voice transmission
9) Voice calls
10) Loudspeaker
11) Silent call

Governing Legislation:
Safety Health and Welfare at Work Act 2005. Safety Health and Welfare at Work (General Application) Regulations 2007, Part 2, Chapter 1 – Workplace. Safety Health and Welfare at Work (General Application) Regulations 2007, Part 6, Chapter 3 – Night Work and Shift Work.

13.0 Unattended and/or Overnight Experiments.

1) Experiments in general should not be left unattended. In particular, lighted Bunsen burners or other sources of flames should **NEVER** be left unattended.

2) Where experiments involving running water, reflux apparatus, rotary evaporators, water baths, or other laboratory equipment, are set up by undergraduate students and may require to be left unattended for a short period of time during normal working hours, the class supervisor, demonstrators, and/or technicians must check that the equipment has been set up correctly and safely.

3) Anyone wishing to leave an experiment running outside of normal working hours or overnight must complete in full an Overnight experiment form which will be posted beside the experiment. Please complete the form in non-technical language to provide clarification as personnel that are not familiar with Science may have to take remedial action in the case of an accident. (Ref Appendix 4.0 & 5.0 for forms)

4) An authorized person (academic teaching staff, post-doctoral fellows, and technicians) must ensure that any overnight experiment is set up correctly and safely.

5) At the end of normal working hours, technicians will shut down any unattended experiments in teaching and research areas that do not carry a completed, signed Overnight Experiment Form.

14.0 Delivery Onsite of Chemical and Biological Substances.

The Technical Support Staff generates orders of the above items intended for use in the support of courses other than postgraduate research. In the case of postgraduate research, postgraduate students,

Post Doctoral Fellows and/or other research personnel order materials for the support of their own projects under the supervision of an academic staff member. At the time of ordering MSDS sheets, relevant data sheets in the case of biological substances, and written procedures for clean up of accidental spillage's will be requested from the suppliers where appropriate.

When deliveries arrive at the premises a caretaker or administrative personnel should immediately inform the science technicians of such deliveries. The science technician will be familiar with the Risk and Safety Phrases contained in the Clarification.

The science technicians will inspect the goods for signs of damage or leaks etc. The science technician will inspect the package or container and decide on an external or internal storage location for the item.

14.1 Hazards:

1) See section 6.0 General Laboratory Housekeeping
2) See section 7.0 Manual Handling
3) See section 19.0 Chemical Safety
4) See section 22.0 Fire Safety: fire due to storage of quantities of combustible materials

Risk Assessment	Medium

14.2 Control Measures:

1) All technical staff shall be trained in safe manual handling techniques. Measures shall be taken to reduce the amount of manual handling to a minimum and mechanical handling devices supplied and used in so far as is reasonably practicable. Mobile trolleys shall be used wherever practicable for transporting goods, particularly chemicals to reduce the risk of spillages. Where a trolley or other mechanical aid is required science technicians should work in pairs. Individual Winchester bottles (i.e. 2.5L glass containers) should never be carried by the neck but only in the proper Winchester carrier. In the case of transportation to or from the external chemical stores science technicians should carry out this task in pairs.
2) Suitable personal protective equipment (PPE) must be available as required for the handling of materials which could cause injury.
3) The chemical / consumable store area shall be kept clean and tidy at all times.
4) Stored packages and boxes containing chemicals must be regularly inspected to ensure their integrity.
5) Spill kits should be available to deal with chemical spillages.
6) Safety data sheets should be supplied with chemicals on first delivery and should be consulted regarding suitable conditions of storage, including segregation of incompatible materials
7) Chemical storage cupboards should have warning labels affixed to the outside, informing persons of the nature of the contents.
8) A spark-proof facility should be provided for the cold storage of volatile liquids.
9) Storage and stacking of goods must be done in specifically designated places and located in such a manner as to minimise the Hazards: of goods falling.
10) Goods should not be placed in overhead locations, such as on top of presses and ledges over doors where they can fall and strike persons below.
11) All waste shall be properly cleared away daily.
12) Any signs of vermin (droppings, actual sightings etc) shall be reported at once and vermin control company requested to carry out a more thorough check.

13) The chemical store area is an emergency escape route and is to be used for delivery and collections only. Unauthorised parking is prohibited and cars will be clamped.

Governing Legislation:
Safety Health and Welfare at Work Act 2005.
Safety Health and Welfare at Work (General Application) Regulations 2007 Part 2, Chapter 1 – Workplace.
Safety Health and Welfare at Work (General Application) Regulations 2007, Part 2, Chapter 4 – Manual Handling of Loads. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 7, Chapter 1 – Safety Signs at Places of Work. Chemicals Act 2008. Safety, Health and Welfare at Work (Carcinogens) Regulations 2001. Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001, HSA 2007 *(Ref. HSA0240).*

15.0 Cryogenics and Dry Ice.

Liquid Nitrogen/ Helium.

Non-toxic, inert, colourless, odourless, non-corrosive, non-flammable liquefied gas. It may cause Suffocation due to Oxygen depletion when released into a confined area, since large volumes of gas are produced on vaporisation: 1 volume of liquid nitrogen expands to produce almost 700 volumes of nitrogen gas. Helium gas has an expansion ratio of 1:760. Contact with liquid or cold vapours can cause frostbite or freeze burns in exposed tissues. Its boiling point is -196^{o}C.

Dry Ice.

Is the solid form of carbon dioxide, it is used primarily for cooling. Its advantages include lower temperature than that of water ice and not leaving any residue.

Dry ice sublimates at 194.65 K (−78.5 °C; −109.3 °F), at Earth atmospheric pressures. This extreme cold makes the solid dangerous to handle without protection due to burns caused by freezing (frostbite). While generally not very toxic, the out gassing from it can cause abnormally elevated carbon dioxide levels in the blood) due to build up in confined locations.

15.1 Hazards:

1) Freeze burn, frostbite and possible tissue loss
2) Asphyxiation
3) Manual Handling for information on mechanical Hazards: associated with handling dewars. Ref Section 7.0.

Risk Assessment	Medium

15.2 Control Measures:

1) All staff working with low temperature liquefied atmospheric gases or with systems that require such gases should be trained in their safe use. Special attention should be given to the

insidious nature of the risks, due to the rapidity of the effects coupled with the fact that an operator may be completely unaware that a hazardous condition has developed.

2) There should be hazard-warning pictograms where cryogenic gases are used.
3) Upon arrival at the site of the liquid nitrogen or liquid helium delivery truck the science technicians should be advised immediately by the Caretaking staff. The science technicians will accept delivery of the liquid nitrogen from the supplier into a liquid nitrogen dewar. Liquid helium comes supplied in its own dewar. Prior to handling any cryogenic substance the following PPE must be worn which includes:
    - Cryogenic gloves
    - Lab coat with sleeves pulled over cuffs of cryogenic gloves
    - Safety glasses
    - Closed toe footwear should be worn when using cryogenic substances
    - Full length trousers must be worn
    - Low oxygen alarm be available to the technician for use in the NMR room when filling the instrument
4) The dewar is supported on the appropriate transportation/pouring trolley. Access to the upper floors of the building will be via the lift. Persons should not accompany the liquid nitrogen or helium while it is traveling in the lift as a precaution against being trapped in a confined space with the cryogenic substance in the event of lift failure/stalling. Never transport liquid nitrogen in an open container.
5) Never refill dewars or transfer liquid nitrogen or liquid helium alone.
6) Make sure that there is good ventilation. Open a door if you are in a small room.
7) Before transporting a dewar containing cryogenic substances from outside the building to the specified area make sure the dewar is in good condition. Release any gas pressure already built up in the dewar by opening the vent valve / pressure relief valve.

15.3 Emergency Procedures

1) If there is a large spill of liquid nitrogen or liquid helium, evacuate the room / building leaving the doors and windows open to ventilate the room. Report the incident immediately to your supervisor or a member of the technical staff.
2) For skin contact with cryogenic liquid nitrogen, remove any clothing that may restrict circulation to the frozen area. Do not rub frozen area, as tissue damage may result. As soon as is practical, place the affected area in warm water that has a temperature not in excess of 40°C (105°F). Never use dry heat.
3) In the case of massive exposure, remove clothing while showering the victim with warm water.
4) If the eyes are exposed to the extreme cold of the liquid nitrogen or its vapours, immediately warm the frostbite area with warm water not exceeding 40°C (105°F).

5) *Call the Emergency Services (999 or 112) as soon as possible*.

15.4 Incident Reporting

All incidents or near misses must be reported within 24 hours by completing an Incident Accident & Report Form.

Governing Legislation:
Chemicals Act 2008. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 7, Chapter 1, Safety Signs at Places of Work BS 5499:2002 Graphical symbol and signs. Safety signs, including fire safety signs
Guidance Documents
Care with Cryogenics – The safe use of low temperature liquefied gases, BOC Gases.

16.0 Compressed Gasses.

16.1 Piped Compressed Gasses

16.1.1 Hazards

1) Fire
2) Explosion
3) Cylinder with a damaged valve acting as a high-velocity projectile
4) Ref Section 7.0 – Manual Handling, associated with handling of cylinders
5) Asphyxiation
6) Release of toxic chemical gas

Risk Assessment	Medium

16.1.2 Control Measures

1) Gases that are piped in the University include CO_2, N_2, He, H_2, Argon, Acetylene, Air and town gas. Gas Safety Data Sheets shall be available for all piped compressed gases.
2) All staff using compressed gases should be instructed in safe techniques for their use.
3) PPE should be used, including protective clothing, suitable gloves and face or eye protection as appropriate.
4) Gas cylinders should be properly housed on the exterior of the building and the gases piped in. All piping should be clearly labelled with the type of gas be carried by that piping.
5) All tubing and regulators must be compatible with the gas type and the working conditions.
6) Where gases are in use, constant and thorough ventilation must be maintained.
7) When flammable gases are in use all ignition sources must be removed from the immediate area.
8) All valves must be tightly shut when not in use. All outlets shall be regularly checked for leakage. All leakages must be reported immediately to Head of department.
9) Outside piping for compressed gases must be properly insulated.

10) Flexible pipes at manifolds must be visually inspected and replaced when necessary.
11) A gas-leakage detection system should be provided to detect gas leaks within the gas storage area and especially for hydrogen and other highly combustible gases and toxic gases.
12) The compressed gas system must be maintained annually to ensure its integrity and safety.

16.2 Compressed Gas Cylinders

16.2.1 Delivery

1) Only cylinders supplied and pre-filled by a reputable company may be used.
2) Gas cylinders should be transported in open vehicles.
3) On delivery, cylinders should be kept in an upright position.
4) Cylinders should always be moved on a gas trolley to which the cylinder must be securely strapped.

16.2.2 Use

1) Gas Safety Data Sheets shall be available for all compressed gas cylinders in stock.
2) All staff using cylinders should be trained in the safe use of cylinders and techniques in the safe manual handling of cylinders. Only trained personnel are allowed to turn on instrument gases.
3) When handling gas cylinders suitable PPE should be worn – protective clothing, suitable safety shoes and face or eye protection as necessary.
4) Constant and thorough ventilation must be maintained where cylinder gases are in use.
5) When flammable gases are in use all ignition sources must be removed from the immediate area.
6) All operating cylinders must be fitted with the appropriate type of piping and regulator for the intended use. The regulator must have a pressure gauge attached to indicate the gas level in the cylinder.
7) Outlets must be fitted with suitable pressure gauges and manual cut off switches/valves (preferably a push-button gas stop switch to allow rapid isolation of gas supplies in the event of an emergency).
8) All piped gas outlets must be clearly labelled with the name of the gas.
9) When disconnected from equipment the regulator should be removed from the cylinder.
10) Cylinders must not be moved with equipment. The valves must be closed and they must be properly secured in a suitable cylinder trolley when being moved. They must not be rolled along the ground. Cylinders must not be transported in private vehicles.
11) Any cylinder involved in an incident shall be removed from service and set aside, clearly marked to be returned to the supplier where applicable.

16.2.3 Storage

1) The storage area for gas cylinders must be well ventilated and weather protected. Cylinders should be stored in an upright position and secured against a solid wall or bench using clamps.
2) Full cylinders should be stored separate from empty cylinders. Cylinders should be clearly labelled to indicate the gas type and whether or not the cylinder is full or empty.
3) Spare cylinders must not be stored in the laboratory.
4) Empty cylinders should not be stored for longer than necessary.

5) The minimum number of cylinders possible should be kept in storage.

16.2.4 Identification:

Gases may be identified by the cylinder colour. Therefore cylinders must not be painted or the markings thereon interfered with or changed in any way. Neither must the cylinder valve or its threads be tampered with or modified in any way. Colour coding on cylinders is currently being replaced, as shown in the following table. However it may be several years before all cylinders are painted in the new colors.

Gas	Old Cylinder Colour (BS349)	New Cylinder Colour (EN 1089-3)	Valve Thread
Oxygen	Black	Black with white shoulder	Right hand
Compressed Air	Grey or Grey with green shoulder	Grey with green shoulder	Right hand
Acetylene	Maroon	Maroon	Left hand
Argon	Blue	Green and grey	Right hand
Nitrogen	Grey with black shoulder	Grey with black shoulder	Right hand
Food Grade Air	Grey with blue shoulder	Grey with blue shoulder	Right hand
Carbon Dioxide	Black or black with two vertical white lines	Black/black with two vertical white lines, with grey shoulder	Right hand
Hydrogen	Red	Red	Left hand
Helium	Brown	Brown	Right hand

Table 3

a) To prevent the interchange of fittings between cylinders containing combustible gas and non-combustible gas, the valve outlets are threaded in opposite directions.

b) The actual valves in all gas cylinders, whether they contain combustible or non-combustible gas, are opened by turning anti-clockwise, closed by turning clockwise.

16.2.5 Emergency Procedures

Escape of Gas: If a gas escape is large, LEAVE THE AREA IMMEDIATELY. Close all possible doors. Put up a NO ENTRY sign. Inform the Security Personnel. It may be necessary to operate the nearest Fire Alarm point.

For small non-toxic leaks, ventilate, evacuate, seal and secure the area inform the Head of Department.

16.3 Town Gas

The most common source of fire in a lab is from the misuse of gases and electricity supplies.

The following points must be observed in relation to natural or town gas that is used for Bunsen burners;

1) Only members of staff should turn on or off the gas supply.
2) Only gas outlets on the benches fitted with the correct Bunsen burners may be used.
3) Never leave a Bunsen burner unattended at any time.
4) The lab supervisor must ensure that all Bunsen burners are turned off before they leave the lab unless otherwise arranged.

5) Technical staff should check the Bunsen burner tubing regularly for signs of splitting. If splits are found, the tube can be repaired by cutting away some of the reinforced end or if the spilt is large then the tubing should be removed immediately and replaced.

Governing Legislation:
Safety, Health and Welfare at Work Act, 2005. Safety, Health and Welfare at Work (General Applications) Regulations 2007, Part 2, Chapter 2 – Use of Work Equipment.

Guidance Documents

BS EN 1089-3:2004 – Transportable gas cylinders. Gas cylinder identification (excluding LPG). Colour coding.
BS EN ISO 10297:2006 – Transportable gas cylinders. Cylinder valves. Specification and type testing.

17.0 How to Perform a Risk Assessment.

The most important thing about assessing the risk from exposure to chemicals is to know the chemicals in question, adopt a step-by-step approach to identifying all the possible means of exposure, and to understand the effects that such factors as duration and frequency of exposure can have on the risk of harm being caused.

Ref Appendix 6.0 for appropriate Risk Assessment form

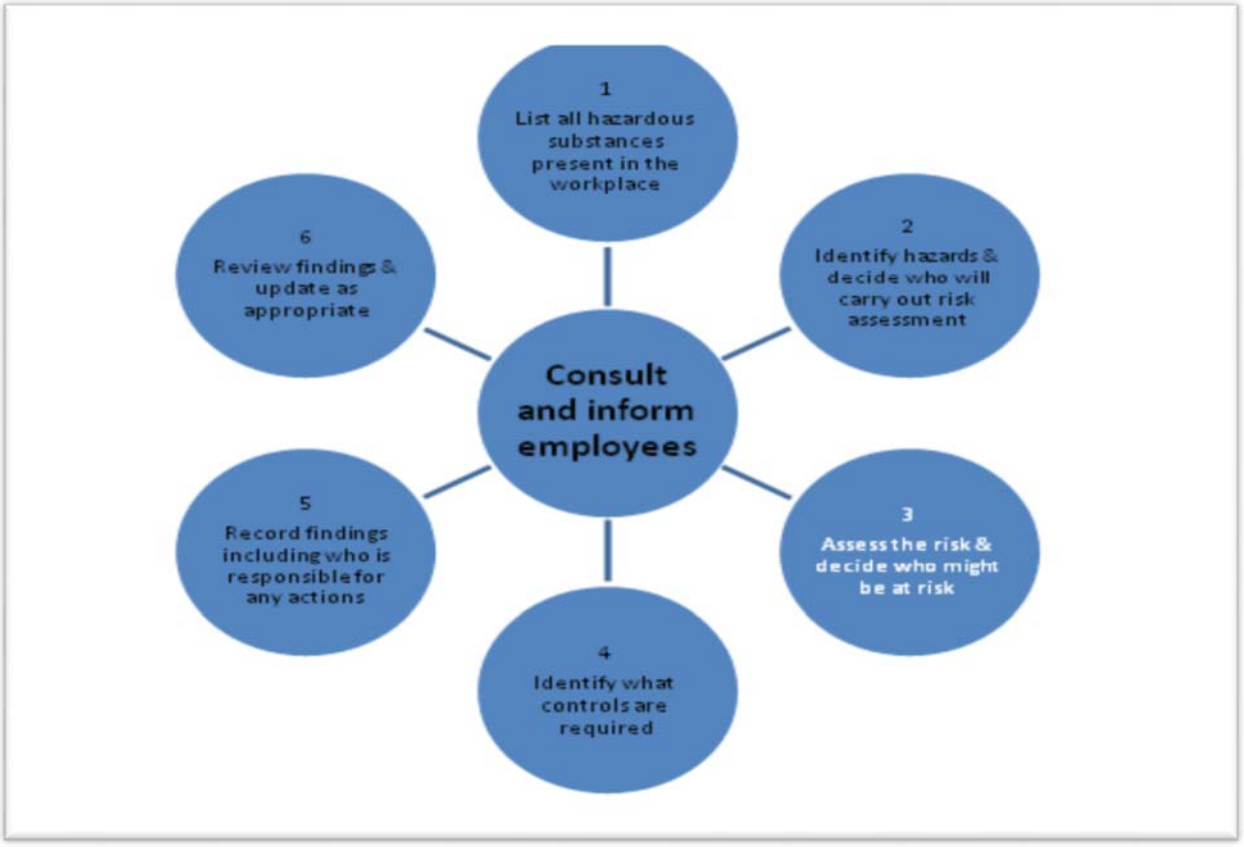

Image 2.0 Risk Assessment flow chart

In considering the Hazards: to be put in place the employer must take into account the following hierarchy of Hazards:

(i) Is it possible to change the process or activity so that the hazardous substance isn't needed or generated?

(ii) Is it possible to replace the substance with a safer alternative?

(iii) Is it possible to use the substance in a safer form, e.g. pellets instead of powder?

If prevention (by elimination or substitution) is not reasonably practicable then review the engineering controls available:

1) Can the process be totally enclosed?
2) Are partial enclosure and/or use of extraction such as Local Exhaust Ventilation? (LEV) possible?
3) Is General Ventilation provided?
4) Can systems of work and handling procedures which minimise the chances of hazardous materials leaking or otherwise escaping, e.g. using a dosing pump to add material as opposed to pouring, be used?
5) Can the number of employees potentially exposed be reduced or can the duration of exposure be reduced?

It must be remembered that PPE (including respiratory protective equipment (RPE)) will only protect the person wearing it (subject to its being appropriate, suitable and the person is trained etc.). It will not reduce the exposure to the work environment or protect those in the vicinity of the exposure who may not be wearing PPE (including RPE). Generally PPE should not be the primary means of protection used for workers. PPE is a 'last resort' and other means of control must be considered before its use. Frequently, to achieve adequate control, an employer must implement a number of different Hazards: collectively.

The Regulations require the employer to control exposure to hazardous chemical agents to as low a level as is reasonably practicable.

18.0 Hazard Identification and Risk Hazards:

Hazard Inspections

1) The policy of the College is to identify Hazards: in the place of work, to assess the risk to safety and health and to control risks as far as is practicable so that they are reduced to an acceptable level. Safety audits are carried out periodically. Records of these are held.
2) "Hazard" is taken to mean "any substance, article, material or practice which has the potential to cause harm to the safety, health or welfare of employees at work".
3) "Risk" is taken to mean "the potential of the hazard to cause harm in the actual circumstances of use".

4) A risk assessment is a careful examination of what, in the workplace, could cause harm to people, so that the employer can weigh up whether enough precautions have been taken or that more should be done to prevent harm. Workers and others have a right to be protected from harm caused by a failure to take reasonable Hazards:.
5) Risk Assessment is based on the linking of the probability of occurrence with the severity of loss and /or injury:

	Severity of Loss or Injury			
Probability of Occurrence		**1**	**2**	**3**
	1	Low	Low	Low
	2	Low	Medium	Medium
	3	Medium	Medium	High

Table 4.0

Here, risks are graded as "High", "Medium" or "Low",	
High	Occurrence is probable, and could cause a fatality, serious injury or serious ill health to an individual or group of people.
Medium	Occurrence is possible and could cause injury or ill health to an individual or a small group of people.
Low	Occurrence is possible but unlikely, only minor injury would be caused and would probably be limited to a single individual.
Risks classified as "low" are deemed to be acceptable as they stand, or with the current controls in place. "Medium" risks should be reduced as low as is reasonably practicable. "High" risks should be eliminated or greatly reduced as soon as possible.	

Table 5.0

18.1 Risk Control

The classification of Hazards: may be used to develop the priority of Hazards:, remedial actions, and the allocation of resources.

Where practicable the University commits itself to the elimination of Hazards: or to the reduction of Hazards: to an acceptable level, whether that be by the provision of access arrangements, risk assessment, containment, the provision of special equipment, training, information, adequate supervision, etc. This approach will take into account normal good practice and the use of standards and guidelines where these are available.

18.2 Considerations when preparing a written risk assessment

1. Hazardous properties
2. Information provided by the supplier of the hazardous chemical agent including information contained in the relevant safety data sheet and any additional information as may reasonably be required to complete the assessment.
3. The level, type and duration of exposure.
4. The circumstances of work involving such agents and the quantities stored and in use in the workplace.
5. Any occupational exposure limits value or biological limit value contained in an approved code of practice.
6. The effect of preventative measures taken.
7. Where available the conclusions from health surveillance already undertaken.
8. Any activity including maintenance and accidental release in respect of which it is foreseeable that there is a potential for significant exposure.

18.3 Risk assessment follow up

1. Arrangements to deal with accidents, incidents and emergencies.
2. Information and training as required.
3. Health surveillance or occupational monitoring if required.
4. Approval by safety coordinator.
5. Reviews at regular intervals or following significant changes in work practices.

18.4 Review of Risk Assessment

The risk assessment should be a 'living' document. It should be reviewed whenever there is reason to think it is no longer valid, e.g. based on results of health surveillance/air monitoring, reports from safety representatives, employers, or supervisors indicating a potential problem, etc.

It should always be reviewed where there have been significant changes in the circumstances of work, such as new work activities/processes involving hazardous substances or changes in the system of work.

Governing Legislation:
Safety, Health and Welfare at Work 2005. Chemicals Act 2008.
Safety, Health and Welfare at Work (Carcinogens) Regulations 2001.
European Communities (Dangerous Substances and Preparations) (Marketing and Use) Regulations 2003 and Amendments, 2006 and 2008. European Communities (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations 2003. European Communities (Classification, Packaging & Labelling of Dangerous Preparations) Regulations 2004 and Amendments, 2007 and 2008. Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001, HSA 2007 *(Ref. HSA0240).*

19.0 Chemical Safety.

Chemicals can produce a wide range of damaging effects on tissue and organs. In the laboratory the greatest risk is of skin damage, followed by skin absorption and inhalation of chemicals. Some chemicals, such as strong acids and alkalis (e.g. chronic acid, sulphuric acid, nitric acid, sodium hydroxide) produce damage within a very short period of contact; others require prolonged, repeated contact before an effect is seen (e.g. liver damage and cancer by inhaled carbon tetrachloride, leukemia by inhaled benzene, allergic contact dermatitis from some chemicals).

In general chemicals will be stored in the external chemical stores and logged into a chemical database. Incompatible chemicals will be separated from one another and where appropriate segregated into chemical storage presses wearing appropriate PPE. In general the chemicals will be stored in accordance with their physico-chemical hazard identification. Acids are separated from alkalis, nitric acid is separated from organics and flammable and oxidizing materials are separated.

Access to either the external or internal store should only be through the Technical Support Staff. The external chemical store is locked and the access is granted by the Technical Support Staff.

19.1 Chemical Agents Risk Assessment

The Regulations require that the University must not carry on work which is liable to expose any employee to any substance hazardous to health unless a suitable and sufficient assessment has been made of the risks created by that work to the health of those employees and of the steps which need to be taken to meet the requirements of the Regulations. The academic supervisor will ensure that all staff and students are aware of the Hazards: associated with specific materials and are trained in how to use and handle these materials properly. A chemical agent risk assessment must be carried out by the supervisor of a project or co-ordinator of an undergraduate laboratory using hazardous chemicals.

19.1.1 Hazards:

Working with chemical agents can leave persons exposed to the Hazards: posed by those chemicals. The associated risks can be exacerbated when a mixture of chemicals are used together. Exposure to chemicals has the potential to cause the following:

1) Contact with skin and skin absorption – irritation, sensitisation, dermatitis, burns, systemic effects
2) Inhalation of dusty or volatile chemicals – asphyxiation, irritation, burns to respiratory tract, sensitisation, occupational asthma
3) Inhalation of solvent vapours – dizziness, narcosis, unconsciousness
4) Accidental ingestion – poisoning, burns to digestive tract, systemic effects

5) Corrosion and burns to contact surfaces
6) Fire and explosion
7) Environmental effects

Risk Assessment	Low/Medium/High	Depending on Chemical Agent

19.1.2 Control Measures:

The Academic Supervisor will ensure that all students are aware of the Hazards: associated with specific materials and are trained in how to use and handle these materials properly prior to use. A chemical agent risk assessment must be carried out as outlined in Appendix 6.0.

19.2 Handling and Use

1. Staff should consult Material Safety Data Sheets (MSDS) of all chemicals used in their laboratories (http://www.sigmaaldrich.com/safety-center.html) as well as Risk and Safety Phrases (RSP). Users should be aware of the properties of each chemical that they use.
2. Chemical agents risk assessments should be carried out to include every new chemical introduced into the laboratory.
3. Suitable PPE must be worn at all times when handling chemical agents. This includes a Howie-style laboratory coat fastened to the neck and appropriate disposable gloves, also safety glasses and face masks if the need is identified by risk assessment. The chemical weighsafe cabinet should be used when weighing harmful dusty solids. The weighsafe cabinet should be left on for 30 minutes after weighing out a chemical to allow material to be removed.
4. The normal practice will ensure that bulk liquid chemicals (i.e. 25L containers) are held in the external chemical stores. The science technicians, wearing safety glasses (or full-face shield) white coat and safety shoes or boots (if deemed appropriate), will dispense from the bulk storage containers by means of a mechanical pump or siphon device. This procedure should be carried out in pairs. The withdrawal from stock must be recorded.
5. All cuts and abrasions must be covered with waterproof plasters.
6. Never taste or smell chemicals.
7. Use fume hoods for handling toxic or carcinogenic solvents or foul-smelling compounds and for conducting any processes that are likely to emit noxious gas, vapour, dust or mist.
8. Never pipette by mouth - use safety pipettes, pipette filters and/or automatic liquid dispensers.
9. Chemicals should be in air-tight containers that are kept closed when not in use and that are fully labelled as to their contents.
10. Trolleys should be used for transporting chemicals to reduce the risk of spillages. Likewise bottle carriers should be used for transporting liquid chemicals.

11. Work processes should be designed to minimise the amount of contaminants and other emissions. Activities that may cause the creation or release of large amounts of dust, aerosols or vapours should take place in a fume hood, as should work with potentially hazardous chemicals and solvents.
12. Persons working with hazardous chemicals must be fully aware of the potential risks from those substances and must be adequately trained and equipped to minimise those risks. They should be aware of the harmful symptoms of exposure to that agent and should cease work immediately if they develop any of these symptoms. Persons should also be vigilant regarding the development of such symptoms in co-workers.
13. Particular caution should be exercised if there is no recorded information about material and/or handling procedures.
14. When use of fire-risk solvents is intended, all potential sources of ignition must be kept from the working area. With carbon disulphide, ethers and petroleum, the vigilance must be extreme.
15. Ethers must not be distilled, unless chemical tests show the absence of explosive peroxides.
16. Eating (including chewing gum) or drinking must not take place in the laboratory, nor should cosmetics or lip balm be applied. Contact with the facial area should be avoided.
17. Long hair should be tied back to avoid contact with specimens, equipment or Bunsen burners.
18. Pregnant or breast-feeding women must not work with any chemicals until a full risk assessment has been undertaken.
19. Lone work with chemicals should be avoided unless it is shown to pose a low risk to the user's safety.
20. A high standard of housekeeping must be maintained in the laboratory at all times.
21. Users should wash their hands after handling any chemical, and especially before eating or drinking.
22. Ensure you know where the fire blankets and the chemical fire extinguishers are and how to use them.

19.3 Storage

1) Chemical agents should be segregated from incompatible materials.
2) The quantities of hazardous chemicals purchased and stored must be kept to a minimum, commensurate with their usage and shelf life. Chemicals which may degrade and become more hazardous during storage should be identified from their Safety Data Sheets and managed appropriately.
3) All containers must be fully labelled, including hazard symbols, risk phrases and safety phrases. If chemicals are decanted into a new container, then it must also be fully labelled and must be suitable for the chemical.
4) Packages must be regularly inspected to ensure their integrity. Damaged packages must be removed to a safe place for repacking or disposal.
5) Containers or chemicals that may be affected by sunlight must not be stored where they may be exposed to direct sunlight.

6) Chemical storage cupboards should have warning labels affixed to the outside, informing persons of the nature of the contents.
7) Chemicals should be stored at eye level or below.
8) Shelves should not be overcrowded. Chemicals should not be near the edge where they may accidentally be knocked down.
9) The quantities of chemicals stored on open shelving in the laboratory should be kept as low as is reasonably practicable.
10) Liquid chemicals should be stored below solids, at a low level to prevent breakage and spillage.
11) Chemicals, equipment and apparatus should not be stored on the floor, or on shelves so as to protrude into traffic areas. Storage of chemicals should be regularly reviewed and any out-of-date materials, safely disposed of (as per Waste Disposal Procedures).

19.4 Special Storage Requirements of Chemicals

19.4.1 Explosive materials

Explosive compounds should be locked in a secure separate store. Production of explosive powders should be avoided and contained.

19.4.2 Moisture Sensitive Materials

Large quantities may be stored externally if they are well sealed, smaller quantities should be stored internally in a desiccator in the store out of direct sunlight preferably in a locked press. The desiccant should be checked regularly.

19.4.3 Temperature Sensitive Materials

Substances that are unstable at ambient temperatures should be stored in a spark-proof fridge or cold-room. These should not be stored in the external store.

19.4.4 Air Sensitive Materials

Only large quantities should be stored externally, as per supplier's specifications, small quantities should be stored internally.

19.4.5 Flammable Materials:

Flammable solvents must be stored in a laboratory in approved fire-resistant storage cabinets, sited as far away from sources of ignition as possible.

a) Reduce to the absolute minimum the quantities of flammable and /or toxic solvents used in chemical operations or held in temporary storage. Flammable solvents should be stored so as not to obstruct doorways, passages or escape routes.

b) Under no circumstances should Flammable liquids be stored only in specially modified refrigerators. Ordinary domestic type "fridges" should not be located in areas where flammable liquids may be used ignition and fire may occur from the normal sparking of ordinary switches and devices in such units.

19.5 Physiochemical Hazards:

19.5.1 Irritants and Sensitisers:

1) When sensitisers are in use in the laboratory, the user must inform all their co-workers of their presence and ensure that no co-workers are sensitised to the agent in question.
2) Respiratory sensitisers should be used in the fume hood.
3) When using skin sensitisers appropriate PPE should be worn to prevent direct skin contact.

19.5.2 Toxic Chemicals:

1) Very toxic agents must be weighted out in a weigh safe cabinet.
2) Suitable PPE must be worn, including disposable gloves which are impermeable to the toxic agent. Contaminated gloves must be removed immediately and disposed of. Contaminated lab coats should be removed, decontaminated appropriately if necessary and laundered.
3) Very toxic chemicals should be stored in a locked cabinet when not in use.

19.5.3 Carcinogens, Mutagens, Teratogens:

1) Wherever possible, these agents should be replaced with less harmful compounds. Otherwise the amounts used should be as low as possible.
2) The number of persons exposed should be as few as possible.
3) Processes should be designed to prevent the generation of dusts, fumes and vapours. Very toxic agents must be weighted out in a weighsafe cabinet.
4) Areas of use should be demarcated if possible, with suitable signage.
5) These agents should be stored in a locked cabinet when not in use.

19.5.4 Corrosive Chemicals:

1) It should be assumed that corrosive liquids are incompatible with other corrosive materials. Acids and bases, in particular, should be stored separately.
2) Fuming acids must always be used in a fume hood.
3) All equipment which comes into contact with a corrosive material, such as storage containers, reaction vessels and spill trays, must be resistant to that material.

19.5.5 Flammable Chemicals:

1) All naked flames in the whole laboratory should be extinguished when handling them.
2) Care should be taken when using electrical equipment in the vicinity of flammable substances as sparks from electrical equipment may ignite flammable substances.
3) The same precaution must also be applied to oxidizing substances as they may also be flammable.

19.5.6 Explosives:

1) Always use small quantities and work behind a protective screen.
2) Care must be taken when mixing two harmless compounds as the resultant compound may be explosive.

19.6 Accidental Release, Spillages and Breakages

1) Technical staff wearing suitable PPE should deal with such occurrences. In the case of accidental release and spillage the affected area will be cordoned off and clearly identified as a hazardous area using signage.
2) Documented procedures (e.g. as in Safety Data Sheets) should be used for cleaning accidental spillages of stored chemicals, with the appropriate spill kits where necessary.
3) Liquid spills must not be allowed to spread, but must be contained and removed with appropriate absorbent material and disposed of into purple cytotoxic bins. Solid spills must be removed by using absorbent tissue and any waste arising must be disposed of into purple cytotoxic bins.
4) Windows exiting to outdoors may be opened to ventilate the area if hazardous vapours are produced

19.6.1 Acid Spillage

Cover the area of spillage with excess of solid sodium bicarbonate. Leave until neutralization is complete. Sweep and collect the neutral solid. Small amounts of residue can be dissolved in water and flushed down the drain. Large amounts should be placed in the bucket with the lid.

19.6.2 Alkali Spillage

Cover with vermiculite and collect into a bucket with a lid. To neutralize large spills, sodium bicarbonate can be used instead of vermiculite. Cover the spill with sufficient sodium bicarbonate to neutralize the alkali. Collect the residue into a bucket with a lid. Wash the floor (or other surface) with water, making sure that the washings are neutral (litmus).

19.6.3 Mercury spillages

Where mercury thermometers are in use, mercury spill cleanup kits should be available. If these are not available Zinc or Sulphur powder can be used to form amalgam. Mercury thermometers should be replaced with spirit filled thermometers where practicable.

19.6.4 Glass breakages

Broken glass should be collected and disposed of in the “sharps” containers in the science labs. If the glassware is contaminated with chemical residues then the broken glassware should be placed in the purple cytotoxic sharp bins. Clean broken glassware or glassware contaminated with bacterial substances is disposed of into yellow sharps bins.

19.6.5 Noxious, volatile, organic chemicals:

Cover with sufficient vermiculite to absorb the entire spilled compound. Sweep up and place into a bucket and cover tightly with a lid.

19.6.6 Release of Noxious/Toxic Substances into the Atmosphere:

If noxious/toxic substances are accidentally released into the atmosphere in a laboratory or associated areas (e.g. chemical stores) the building should be evacuated by ringing the alarm bells (break-glass alarm), situated on every level of the building.

If in doubt, refer to the technical staff to ensure that the correct method of disposal is used.

Individuals affected by the accidental release should be immediately brought to the nurse.

Significant accidents or incidences must be reported on the Incident and Accident Report Form.

The Head of Department will decide whether the affected area has been made safe or not.

Ref Appendix number 7.0 for the SOP of " Emergency Laboratory Evacuation in Case of Escape of Potentially Hazardous Material "

19.7 Personal Protective Equipment (PPE)

- Respirator protective equipment should be tested that they are fit for purpose that it is suitable for the individual using the piece of equipment. This test must be carried out by a fully qualified and competent person as defined in Part 1 of the Safety, Health and Welfare at work Act 2005.

Governing Legislation:

Safety, Health and Welfare at Work 2005. Chemicals Act 2008. Safety, Health and Welfare at Work (Carcinogens) Regulations 2001. European Communities (Dangerous Substances and Preparations) (Marketing and Use) Regulations 2003 and Amendments, 2006 and 2008. European Communities (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations 2003.
European Communities (Classification, Packaging & Labelling of Dangerous Preparations) Regulations 2004 and Amendments, 2007 and 2008. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 7, Chapter 1 – Safety Signs at Places of Work. Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001, HSA 2007 (Ref. HSA0240). Health and Safety Authority – a guide to Respiratory Protective Equipment. Safety Health and Welfare at Work Act 2005
Legislation. Chapter 3 part 2: Personal Protective Equipment of the Safety, Health and Welfare at Work (general applications) Regulations, 2007

20.0 Waste Disposal.

Waste and excess must be disposed of quickly to avoid accumulation of large stocks. Fastened White coats and safety glasses or goggles must be worn at all times when dealing with all categories of waste. Full breathing apparatus must be used when emptying waste receptacles into the Intermediate Bulk Containers

(IBCs) in the bunded area and the procedure is always performed in pairs. It is important to appreciate that chemicals of an oxidizing, flammable, explosive, toxic, carcinogenic or harmful nature remain so even when they are considered as waste. The waste material is at least as hazardous as the sum of its components.

20.1 General Waste

20.1.1 Hazards

- Fire due to combustible materials
- Trips and falls from improper storage of waste on walkways, escape routes etc.

Risk Assessment	Low

20.1.2 Control Measures

1) The cleaning staff must empty waste bins, recycled paper boxes and the cardboard boxes for recycling on a regular basis.
2) Items of hazardous waste must not be put into general waste bins.
3) General waste should not be included with hazardous waste.
4) Suitable PPE should be worn when handling waste.
5) Waste electrical and electronic equipment shall be placed in designated areas for collection and recycling by a licensed company.
6) Students must be trained in the use of the various different waste receptacles within the laboratory.
7) An effort should be made to minimise the amount of general waste generated and accumulated at the University. Good housekeeping practices should be encouraged e.g. disposal of old catalogues as soon as new ones become available, the use of computer based catalogues instead of paper copies, etc.

20.2 Solid Waste

1) Non hazardous chemical waste in solid form can generally be double-bagged and placed in the normal waste bins or water can be added and they can be flushed to drain with copious amounts of water.
2) Solid hazardous waste with chemical agents shall be collected in UN3291 bulk containers with purple lids to indicate that the solid waste is cytotoxic. These cytotoxic bulk containers are placed within a sealed liner inside the red wheeled bins in the Biology Department.
3) The inner liner is sealed when the bin is full and the outer bin lock is fastened. These are then stored in the outside Science yard prior to being sent to a licensed agent for disposal.
4) In the Chemistry department these bulk containers are stored outside on a pallet prior to being sent to a licensed agent for disposal.
5) Broken glassware contaminated with chemical residues should be placed in the appropriate yellow bins

20.3 Bio-hazardous Waste

Please refer to the SOP of Infection Control Policy for Management of Bio-hazardous Waste found in the Laboratory Biosafety Manual for a full description of this process.

Solid waste with biological agents (including agar plates, paper and gloves used with infectious and other hazardous materials) are disposed of in a double autoclave bag located in appropriate floor stands within Biology laboratories. When three-quarters full, the bags are sealed, rendered safe by autoclaving and placed in a yellow UN3291 autoclavable biohazard bags. These bags are sealed and placed within a sealed liner inside the yellow and grey wheeled bins. The inner liner is sealed when the wheeled bin is full and the outer bin lock is fastened. These wheeled bins are stored in the outside Science yard prior to being sent to a licensed agent for disposal. Bags of waste are not to be stored in laboratories as they are a fire hazard and a trip hazard.

20.4 Sharps Waste

1) Please refer to the SOP of Infection Control Policy for Management of Bio-hazardous Waste found in the Laboratory Biosafety Manual for a full description of this process.

2) Every effort should be made to minimise the use of items that result in a sharps hazard in the University e.g. substitution of plastic Pasteur pipettes for glass ones should be encouraged. Only “sharps” material should be placed in “sharps” containers. Broken glassware should also be considered as sharps waste. Rubber gloves, paper tissue and other miscellaneous non-sharps waste should not.

3) Sharps should be disposed of in designated UN3291 sharps containers. If they contain chemical residues the waste is placed in a sharps bin with a purple bin. Glassware or needles / syringes contaminated with bio-hazardous material are placed in a sharps bin with a yellow lid. Purple sharps bins are placed within a sealed liner inside the red wheeled bins in the Biology Department. Yellow sharps bins are placed within a sealed liner inside the yellow and grey wheeled bins. The inner liner is sealed when the wheeled bin is full and the outer bin lock is fastened. These wheeled bins are stored in the outside Science yard prior to being sent to a licensed agent for disposal. In the Chemistry department these sharp containers are stored outside on a pallet prior to being sent to a licensed agent for disposal.

20.4.1 Hazard

1) Potential to cause cuts and infections, especially to cleaning staff.

Risk Assessment	High

20.4.2 Control Measures:

1) Waste “sharps” should not be placed in ordinary waste bins.

2) The special sharps boxes provided should be used. Do not overfill, and seal when full. When filled and sealed, the sharps bin should be removed promptly to either the appropriate wheeled bin or the Science yard on a pallet prior to collection.
3) Used blades and hypodermic needles should be promptly disposed of after use. They must not be left out on bench and needles must never be re-sheathed.
4) Broken glass should be swept up and disposed of in a sharps box. The surrounding work area and adjoining floor should be checked for fragments.

20.5 Empty Containers

The small effort expended in cleaning a container after it has been emptied is good practice. Prior to disposal, empty containers should be cleaned free of any chemical residues by, for example rinsing with cold water or leaving to evaporate in a fumehood. Accidents frequently occur from the use of a dirty container returned to stores or left in the laboratory. Clean empty bottles are disposed of in the bottle bank located in the Science yard. Clean plastic containers can be disposed of in general waste. If the bottle / container is still contaminated after rinsing then the receptacle should be placed in a cytotoxic sharps bin (if glass bottle) or a cytotoxic bulk bin (if plastic container).

20.6 Biological Waste

Please refer to the SOP of Infection Control Policy for Management of Bio-hazardous Waste found in the Laboratory Biosafety Manual for a full description of this process.

In an effort to minimise the amount of biological waste generated in the University, waste minimisation techniques should be employed. The use of micro and semi-micro techniques should be considered, and also the use of procedures which generate the least hazardous waste products.

20.6.1 Disposal and Disinfection

Dry waste material is autoclaved and placed into Biohazard bags that are then sealed and are moved off-site by an approved contractor for decontamination and disposal as detailed in the SOP of Infection Control Policy for Management of Bio-hazardous Waste found in the Laboratory Biosafety Manual. The waste is routed for treatment through Eco-Safe Systems, Unit 1A Allied Industrial Estate, Kylemore Road, Dublin 10, approved under E.P.A. Licence 54/2, in accordance with the Waste Management Act, 1996 and Waste Management (Licensing) Regulations 2004. Non-autoclaved laboratory wastes are included. Wastes not suitable for treatment are exported from the transfer station for incineration. The movement of hazardous waste from the University is recorded and controlled by the use of C1 forms under the Waste Management (Hazardous Waste) Regulations 1998 and Amendment 2000. A Certificate of Acceptance and Destruction of Clinical Waste /Healthcare Risk Waste is received from Eco-Safe Systems and is held on file.

All potentially pathogen-containing **liquid waste** should be collected in containers and treated with an appropriate disinfectant (See Laboratory Biosafety Manual) or autoclaved before being flushed down the sink with plenty of water.

20.6.2 Genetically Modified Organisms (GMO) Waste

Class 1 & 2 GMO waste is treated as biological waste and all waste material must be autoclaved on site prior to disposal by a licensed waste disposal agent.

20.7 Chemical Waste

20.7.1 Waste Minimisation:

1) Chemical redistribution and recycling – Unopened or unused portions of chemicals may be redistributed within the University.
2) End of Process Treatment – End of process treatment procedures should be used where practicable. Non-hazardous acids and bases may be neutralised to pH 6-9 and flushed down the drain. Many water-based chemical compounds may be diluted and flushed down the drain. However, environmental considerations must be taken into account, especially regarding nitrates and phosphates.
3) Management – Audit of chemical supplies and use of inventory control.
4) Purchasing – Only the required quantity of chemicals should be purchased, particularly so with "problem" chemicals. Chemicals should not be stockpiled unnecessarily.
5) Process Modification – To the extent that it does not compromise vital research, teaching or service, laboratories are encouraged to modify experimental or standard processes to decrease the quantity of hazardous chemicals used and generated. Where possible, micro or semi-micro techniques should be used to reduce the amount of waste generated.
6) Product Substitution **–** Substitution of non-hazardous or less toxic materials in chemical processes and experiments.
7) Segregation and Characterisation – Chemical wastes should be accurately labelled. Mixtures of chemical wastes should be labelled as accurately as possible, giving the percentage composition of the various component chemicals. Incompatible chemical wastes should not be combined.
8) Training **–** Training in waste minimisation techniques should be given.

20.7.2 Disposal

The same handling, use and storage controls apply to chemical wastes as apply to chemical agents in use in the laboratory.

1) Hazardous chemical waste, which cannot be rendered harmless to persons or the environment on site, must be labelled accurately, and stored in the fumehoods using the appropriate waste receptacle.

2) Liquid waste is segregated into inorganic, non-halogenated and halogenated waste and each of these has its own waste receptacle located in the various fumehoods. The fumehood must be turned on and the screen pulled down as far as practicable when emptying waste into these receptacles.
3) Organic wastes should be emptied into labelled containers, and stored in the fumehood until they are transferred to the IBC in the Science yard. Liquid waste containers should be removed and replaced when 80% full and safely stored for disposal.
4) All persons involved in emptying waste receptacles into IBCs must work in pairs and wear full PPE including full breathing apparatus, gloves and white coat.
5) Chemicals which may cause harmful environmental effects, either to plant or animal life must not be discharged to the foul sewer and must be treated as hazardous waste. Compounds that lead to eutrophication of watercourses, such as nitrates or phosphates, must also be treated as hazardous waste.
6) Water based compounds can be diluted and discharged to the foul sewer (except nitrates and phosphates). Common buffer salts may be diluted with copious amounts of water and discharged to the foul sewer.
7) Acids and bases should be neutralised to the pH range 6-9 before discharge to the foul sewer.
8) Enzymes or catalysts, biological waste, DNA material, mutagenic or carcinogenic waste is classified as hazardous.
9) All dyes must be treated as hazardous.
10) Explosive type chemicals should be separated from the main waste. Not all explosive type chemicals will be removed, and are accepted on a case-by-case basis by the waste disposal company.

Governing Legislation:
Waste Management (Hazardous Waste) Regulations 1998 and Amendment 2000. Environmental Protection Agency Act 1992. Waste Management Act 1996. Waste Management (Amendment) Act 2001. Protection of the Environment Act 2003. Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005. European Communities Waste Directives.

21.0 Electricity.

Electricity is the presence and flow of electric charge. Using electricity we can transfer energy in ways that allow us to accomplish common chores. Its best-known form is the flow of electrons through conductors such as copper wires.

21.1 General Electrical Safety

21.2 Hazards:

- Electric power is a hazard with the power to cause any of the following:
- Electric Burns
- Electric Shock
- Fire
- Trips or falls over loose cables

Risk Assessment	High

21.3 Control Measures:

1) All new fixed and temporary wiring will be to the latest Irish standards (either BS, EN or CE standards) and in compliance with ETCI (Electro-Technical Council of Ireland) rules for electrical installations.
    - https://www.hsa.ie/eng/Topics/Electricity/Inspection_and_Testing/2008_ETCI_Wiring_Regulations/
2) The University will ensure that a competent qualified electrician checks the wiring installation on the premises.
3) All electrical repairs, splices, and wiring shall be performed by a competent and fully qualified electrician to comply with ETCI (Electro-Technical Council of Ireland) standards. Only a qualified person may attempt to affect repairs, either temporary or permanent, to the electrical supply system or to any electrical appliances.

21.4 Wiring Equipment and Machinery

1) Any person carrying out work on the electrical installation or any accessories or equipment connected thereto should normally isolate the equipment first by removing the main fuse or locking off the isolator. Live working will not normally be allowed and if there is a chance of inadvertent contact with live parts, then special precautions will be taken by authorised electricians, e.g. the use of insulated test prods, insulating rubber mats and other back-up precautions. In such circumstances a second person must be in attendance to render emergency assistance if required. If in doubt, the circuit must be tested using safe equipment to prove that it is dead.
2) Notices must clearly indicate when live working is being carried out. No un-authorised personnel shall be allowed access to such an area while the work is in progress.
3) All electrical equipment, appliances and leads shall be of good quality and in good working order and damaged leads, plugs, etc. should not be allowed to remain in service.

4) Equipment must be fitted with correctly rated fuses.
5) Sufficient sockets will be provided to prevent overloading by use of adaptors. Multi-outlet plugs can cause overloading on electrical wiring and shall not be used unless they have a built-in circuit breaker.
6) Cables used for outdoor equipment will be of a heavy duty protected or armoured design. Armouring of conducting material must be earthed.
7) Flexible cables should not be run across floors or be placed under heavy objects or on pathways or other areas where repeated abuse can cause deterioration of insulation. Where damage to cables at floor level is possible, protection by ramps, conduit or armouring will be considered and applied.
8) All electrical equipment shall be properly grounded. It is essential that all accessible metalwork be earthed.
9) Live parts of machines should be properly screened. Interlock switches provided for guards should not be capable of inadvertent operation.
10) Flammable liquids should not be used or stored near to, or allowed to come into contact with live electrical parts.
11) Where equipment is required for ongoing/overnight experimental work it should be clearly marked as such and should be recorded in the overnight experiment form (see section 35.3 (a) and (b)).Otherwise all equipment not in use should be switched off, especially at the end of a working day, unless of a specialist type, e.g. experimental apparatus in on-going use, fridges, growth cabinets.
12) Electrical equipment (stirrers, shaker, rockers etc.) should not be left for long periods in the cold room and must be removed when the experiment is complete.

21.5 Reporting Faults

1) If for any reason there is an electrical fault, either partial or total, the technical staff and the Buildings department should be immediately contacted to attend and remedy the matter.
2) Dangerous or defective material should be replaced or remedied. All extensions, alterations and repairs to electrical circuits should be carried out by a qualified electrician.

21.6 Electrical Equipment in the Laboratory

1) Staff should note the positions of all emergency electrical cut-off switches and their correct use.
2) Only members of staff should turn on or off the electrical supply.
3) In the case of students, no piece of electrical equipment may be turned on or plugged in, without first checking with a member of staff in its correct use.
4) All electrical equipment used in a laboratory setting must be suitable for the task undertaken and the environment in which it is to be used. This is particularly important when selecting electrical equipment for use in wet environments or in areas where flammable chemicals are stored or handled.

5) When laboratory electrical equipment is being serviced it should be thoroughly decontaminated beforehand so as to remove all chemical or biological contamination.
6) Electrical equipment should be visually inspected on a regular basis to ensure that the potentially corrosive atmospheres in fume hoods and in areas were chemicals are stored and used have not damaged the equipment or its wiring.
7) Electrical cables should not be run along the floor of laboratories or over lab benches.
8) Laboratory electrical equipment should be unplugged overnight wherever possible.
9) The start and stop devices on all laboratory electrical devices should be readily identifiable.

Governing Legislation:
Safety Health and Welfare at Work Act 2005. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 3 – Electricity.

Sources of Information.
National Rules for Electrical Installations, (4th Edition), *Electro-Technical Council of Ireland, 2008 (Ref. ET101).*

22.0 Fire Safety.

22.1 Fire prevention

1) Never place hot plates or other heating devices against walls or close to bench partitions.
2) Gas burners should be isolated from the bench by heat-resistant material.
3) Inspect gas tubing regularly and reject any that shows hardening or cracking.
4) Open flames should only be used after carefully considering any adjacent apparatus, drafts, walkways, exits and other experiments.
5) Flammable liquids should never be poured into the sink or laboratory drainage systems. This applies also to compounds liable to give off toxic fumes. For the correct disposal procedure consult the laboratory demonstrator in each case.
6) Flammable liquids should only be stored in special fire resistant cabinets equipped with drip-trays or sumps.
7) Fires are sometimes caused by the `magnifying glass' effect of bottles and spherical flasks filled with liquid and standing in the direct rays of the sun.

22.2 Fire extinguishers

1) Get to know the position of fire extinguishers in the laboratory and learn under what conditions they can be used. Extinguishers should be fully visible and unobstructed.
2) Get to know the positions of the fire hose reel, water buckets, sand buckets and fire blanket.
3) Remember that ordinary combustible materials (wood, paper, textiles) can be readily extinguished with water. Dry sand is a very effective means of extinguishing alkali metal fires, so is dry soda ash.

Type of fire	Suitable extinguisher	Limitations
ordinary combustible materials: wood paper, textiles	1) Water. 2) Carbon Dioxide. 3) Sand.	Never use Water in the presence of electrical points or equipment.
flammable solvents oils, liquids electrical equipment	1) Carbon dioxide. 2) Dry Powder.	
gases	3) Carbon Dioxide.	
sodium, potassium metal hydrides magnesium pyrophoric catalysts	Special Purpose. 1) Dry Powder. 2) Sand.	Never use Water or Carbon Dioxide on these fires.

Table 6.0

22.2.1 Carbon dioxide

Carbon dioxide (CO_2) extinguishers are for general purposes

Advantages.

1) They leave no mess around the site of the fire. The action of smothering the fire with carbon dioxide excludes air and extinguishes the flames.
2) Carbon dioxide extinguishers are suitable for dealing with burning fluids on both horizontal and vertical surfaces as well as for fires involving ordinary combustible materials such as wood, paper and textiles.
3) As a non-conductor of electricity, carbon dioxide can be safely used where there is a risk of electric shock. It is also suitable for use on fires involving delicate laboratory equipment.

Disadvantages.

1) It is necessary to get fairly close to the actual fire for them to be effective.
2) They have limited cooling action, and with solvent fires there may be re-ignition after the fire has been extinguished.
3) If used on substances which react with carbon dioxide, such as sodium, potassium and metal hydrides, they are ineffective and could even be dangerous. In these instances special purpose dry powder extinguishers should be used.
4) In confined spaces they reduce the oxygen level and can cause asphyxiation of the fire fighter.

22.2.2 Dry powder

1) Dry powder extinguishers deliver an inert powder on to the fire, and this rapidly extinguishes flames.
2) Dry powder extinguishers are suitable for burning liquids and ordinary combustible materials. They have the disadvantage of leaving a deposit of powder. There are special purpose powder extinguishers which are effective against particularly hazardous fires such as those involving alkali metals and metal hydrides.

3) Dry powder is also a non-conductor of electricity and can be safely used on fires where there is a risk of electric shock.

22.2.3 Foam

1) Foam extinguishers are of limited application and suitable for small fires in confined areas (eg a tray or oven) involving water-immiscible solvents such as petrol or oils. They form a blanket of foam which floats on the surface of the burning liquid, so that air is excluded and the fire extinguished.
2) Foam must not be used where live electrical equipment is involved, or with alkali metals.

22.2.4 Water/carbon dioxide

1) Water/carbon dioxide extinguishers discharge water under carbon dioxide pressure. Although not suitable for chemical fires, they are very effective against ordinary combustible materials (wood, paper, textiles).

22.3 Fire blanket

1) Each laboratory should have a fire blanket for extinguishing fires on clothing.
2) A person whose clothing catches fire should lie horizontally whilst another person smothers the flames with the blanket.
3) Never use a fire blanket on apparatus.

22.4 Emergency Evacuation

The evacuation procedure is given in Appendix 1.0 of this document.

Fire Wardens are in place assist in the evacuation of staff and students. Fire/Emergency Drills are organised annually by the Estates Manager or his assistant and the local Fire Wardens. Feedback on performance in terms of time taken to evacuate and particular difficulties with alarm systems / building fabric are notified to all staff via e-mail. Where the performance of a particular building in a fire drill falls short of the required standard, further drills will be carried out to confirm that required standard is reached.

The Evacuation procedure is posted on the Health & Safety Website. A building by building listing of all trained Fire Wardens is also posted on the web. All Schools/Units/Campus Companies are required to ensure that they have sufficient trained Fire Wardens in place to provide for effective evacuation.

22.5 Persons with Designated Responsibilities

1) The Estates Manager will be responsible for informing the College Safety Officer of any structural alterations that may affect the safe means of escape from the building in case of fire. It is the responsibility of the Estates Manager to ensure that all fire exits are kept clear, unlocked and functional when the building is occupied.
2) Each building is fitted with a fully addressable Fire Alarm System which is maintained by the Estates Office. All alarm activations are received in the Buildings Services Office and are investigated by Caretaking / Security personnel.

22.6 Duties of the Fire Wardens

A list of emergency numbers is given in the appendix 2.0

1) On hearing the alarm, they take charge of their section, ensuring the efficient escape of all persons.
2) Check that all persons have left, close all doors and windows, switch off equipment if safe to do so (and if time permits) and leave all lights on.
3) Report to the "Incident Controller" (one of the caretaking staff), who will be located outside the main front doors of the University, that their section is clear.
4) If they know of anyone who is injured or trapped, they should inform the Incident Controller with maximum haste, giving all relevant information.
5) Wardens should be aware of any person who is a wheelchair user or has impaired hearing, in order to assist them to a safe place. **Wheelchair** users should be brought to the landings in the fire escape staircases. They may have **one** person remain with them until they are assisted from the building.
6) During fire drills, the Wardens should check that the alarm is heard throughout their section, noting any deficiencies in toilets, inner offices etc.
7) Make note of any problems/observations for later discussion.
8) On evacuating their area, the wardens will assist with the orderly and safe movement of personnel through the corridors, down the stairs and out of the building.
9) Wardens should be familiar with the names and areas of responsibility of their fellow wardens on the same floor as indicated on the list. They should take over the responsibility of another area if it is apparent that the warden for that area is absent.

School of Science Fire Wardens	
Name	**Extension**
Deborah Collins	2365
Eleana Dunne	2154
John Jones	2414
Aine McParland	2414
Karen Scattergood	2410

Table 7.0

22.7 What to do in the event of a fire in a laboratory

1) Raise the alarm by breaking the nearest available break glass point.
2) Dial 999 on an external line to call the fire brigade. The caretaking staff should be contacted by dialing 2610 / 2601 to alert them to the extent of the fire.

3) The area must be evacuated immediately following the procedures outlined in the emergency evacuation procedure. The fire wardens in the area will normally perform this role.
4) If the fire is small and contained, faculty/staff should consider using the nearest appropriate extinguisher provided, ensuring that the extinguisher is compatible with the fire.
5) Carbon dioxide fire extinguishers may interact negatively with some lab chemicals. Dry powder extinguishers should generally be used on chemical fires.
6) Water must never be used on an electrical fire or flammable liquid fires.
7) Under no circumstances should students tackle the fire.

22.8 Fire Prevention

22.8.1 Hazards

In common with all premises there is always a risk of fire. Common fire Hazards: in laboratory and office areas include improperly stored combustible or flammable materials, use of naked flames (Bunsen burners) and faulty electrical equipment.

Risk Assessment	Medium

22.8.2 Control Measures:

In order to guard against an outbreak of fire and to ensure as far as is reasonably practicable the safety of persons on the premises in the event of an outbreak of fire the following control measures have been put in place along with the persons responsible.

1). The instruction and training of staff in the use of fire extinguishers	Estates Manager.
2). The holding of fire and evacuation drills	Estates Manager.
3). The maintenance of escape routes – Estates Manager.	Estates Manager.
4). The provision, inspection and maintenance of adequate fire protection equipment and systems	Estates Manager.
5). The provision of assistance to the fire authorities	Estates Manager.
6). Maintenance of Bunsen burner tubing	Technical Staff

Table 8.0

Governing Legislation:
Fire Services Act, 1981. Fire Safety in Places of Assembly (Ease of Escape) Regulations, 1985. Licensing of Indoor Events Act 2003. Safety, Health and Welfare at Work (SHWW) Act, 2005. Safety, Health and Welfare at Work (General Application) Regulations, 2007. Building Regulations 1997 (Technical Document B) Fire Safety.

23.0 Noise.

23.1 Hazards

1) Laboratory equipment, particularly sonicators, pumps, ventilation systems etc.
2) Use of radios in open plan laboratories

Prolonged exposure to loud noise may lead to loss of hearing, increased blood pressure, stress and tiredness

Risk Assessment	Medium

23.2 Control Measures

1) Faulty equipment should be reported and removed from service until repaired.
2) When purchasing laboratory equipment consideration should be given laboratory equipment which has been ergonomically designed to reduce noise production.
3) In some cases it may be necessary to locate equipment in such a manner as to absorb or confine the noise produced while in use.
4) Where sound pressure levels are at 80 dBA hearing protection must be provided.
5) Where sound pressure levels are at 85 dBA hearing protection must be worn and warning signs erected. Control of the noise at source must be investigated.
6) Radios if used in the Lab should be by consent of all personnel and any requests to lower volume should be accepted immediately.
7) Requests to monitor the sound pressure levels and noise complaints that cannot be resolved locally should be directed to the Head of Department.

Governing Legislation:
Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 5, Chapter 1 – Control of Noise at Work.

24.0 Office and VDU Safety.

24.1 Hazards

While office work may not be considered a high-risk activity, unsafe work systems may result in injury or illness.

1) Poor arrangement of furniture, boxes of office materials or exposed electric/telephone cables leading to trips and falls.
2) Sharp corners or open drawers may result in injury.
3) High shelving – personnel attempting to put items on or to take items down from high shelves may fall and be injured.
4) Falling objects – objects stored above head level could cause injury if they fall.
5) Inadequate or inappropriately located lighting or ventilation could be a cause of physical stress and discomfort, as could a poor thermal environment.
6) Bad workstation design or insufficient desk-space may cause undue fatigue and posture defects, leading to long-term problems of muscular strain and backache.
7) Glare, flickering images on the screen, poor brightness or insufficient contrast may cause eyestrain.
8) Litter and other flammable office waste is a fire hazard.

Risk Assessment	Low

24.2 Control Measures:

1) Adequate office space should be provided. All furniture, fittings and equipment should be arranged so that staff can move about without collision with sharp corners of desks, filing cabinets, etc.
2) All items on shelves above head level should be placed properly to prevent falling and causing injury. Stepladders should be provided to access such shelves.
3) Electric or telephone cables should not trail unprotected across the floor. Cable covers or duct tape should be supplied and used. Floor areas should be kept clear of litter and boxes of office materials.
4) Full regard must be given to manufacturer's operating instructions for all equipment. It must be maintained in a good state of repair and cleanliness. When changing printer cartridges or loading photocopier toner, staff should avoid contact with skin or clothing.
5) The mains power supply must be disconnected before attempting to move electrical equipment. Paper shredders should be switched off before shredded paper is removed.
6) Sufficient ventilation should be provided, particularly in the vicinity of photocopiers.
7) Sufficient lighting should be provided and be suitably positioned in relation to the workstation. Ambient temperature should be kept at a comfortable setting.
8) All damaged floor covering, furniture, equipment or machinery should be reported and should be replaced or repaired.
9) Dangerous waste, e.g. broken glass, should be carefully disposed of.

24.3 VDUs and Workstations

1) All VDU personnel should receive suitable instruction and training to include the general principles of ergonomics as they apply to workstations, the proper adjustment and positioning of their chairs, monitors and keyboards, positioning of lighting, etc. to suit the user's height, reach and other physical characteristics.
2) Employees who habitually use VDUs as a significant part of their normal work are entitled to an appropriate eye and eyesight test, to be carried out by a competent person, before commencement of display screen work, at regular intervals thereafter and if they experience visual difficulties which may be due to display screen work. If an employee requires special corrective appliances **solely for work at a VDU screen**, these should be provided at no cost to the employee.
3) The monitor should be of good quality, with a clear stable screen image, free from flicker and glare and with good brightness and contrast, adjustable to suit individual needs. The screen should also have a swivel and tilt facility.
4) The keyboard should have a tilt facility, and keys must be legible. There should be adequate space to rest hands and wrists on the desk in front of the keyboard.
5) The work chair should be stable and comfortable, allowing freedom of movement to give direct access to various elements of the workstation. It should be adjustable in height and tilt, with special back support if required.
6) The work activity should be designed to include short frequent breaks from the display screen.
7) Photosensitive epileptics must seek medical advice before working on VDU equipment.

Eye testing is available for those using VDU's. Details are available through the Human Resource Manager.

Governing Legislation:
Safety Health and Welfare at Work Act 2005. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 2, Chapter 5 – Display Screen Equipment.

25.0 Biological Agents.

Please refer to the Laboratory Biosafety Manual

26.0 Autoclave.

26.1 Hazards:

1) Explosion
2) Hot pipe work
3) Contact with steam
4) Burn risk when removing hot material
5) Manual handling of hazardous, hot and awkward loads
6) Bio hazardous materials

Risk Assessment	Medium

26.2 Control Measures:

1) Every user must notify technical staff of any evidence of wear to an autoclave which may compromise its safe operation.
2) Users must be properly trained before using any autoclave.
3) The manufacturer's instructions should be carefully read before using equipment.
4) The equipment should be tested periodically with biological indicators to ensure correct temperatures are being attained.
5) Protective clothing – heatproof gloves and safety glasses – must be worn at all times during loading and removal of materials. Heatproof gloves should periodically be checked for evidence of wear.
6) The contents of the autoclave should be stacked carefully and ts or buckets not overloaded.
7) Safe manual handling techniques must be employed to prevent injury when loading and unloading the autoclave.
8) The correct programmers for the type of material to be treated must be selected.
9) All spills and leakages must be mopped up immediately.
10) Lids of screw-capped bottles should be loosened before autoclaving to prevent pressure build-up.
11) The water level must be checked and topped up if necessary.
12) All autoclaves are fitted with interlocks to prevent opening of the door until safe temperature and pressure have been reached.
13) Items should be removed with great care as liquids may boil over when moved.
14) Signs indicating that the exterior surface of the autoclave is hot (during use) must be clearly visible around the general area of the autoclave.

Governing Legislation:
Safety, Health and Welfare at Work Act 2005. Safety, Health and Welfare at Work (General Application) Regulations 2007 Part 2, Chapter 2 – Use of Work Equipment.
Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 3

27.0 Centrifuges.

Accidents caused by the disintegration of centrifuge rotors are often very violent. All centrifuges should be fitted with a safety lock which must be engaged before the centrifuge rotor can be started and cannot be opened until the rotor has come to a complete stop.

27.1 Hazards:

1) Foot and leg injury due to movement of unbalanced centrifuges and falling bench-top centrifuges
2) Heavy rotors
3) Incorrectly secured lids

Risk Assessment	Medium

27.2 Control Measures:

1) All new staff and students must be trained in the operation of each centrifuge by an experienced user.

2) The manufacturer's instructions should be carefully read and followed at all times.

3) Recommended rotors, buckets, adaptors and tubes for each centrifuge should be used.

4) The maximum capacity of sample containers and the maximum load for each rotor must not be exceeded.

5) Material loaded into sample tubes must be compatible with the sample tube material, e.g. some solvents can cause tubes to swell and to crack.

6) Sample containers should be leak-proof. Sample tubes should fit comfortablyinto the rotor and should not be too loose.

7) Containers for spinning blood products should be closed to prevent aerosols.

8) The load in the centrifuge must be carefully balanced and be distributed symmetrically across the rotor assembly.

9) Bench-top centrifuges should be mounted on a sturdy, stable and level bench following the specifications of the manufacturer.

10) Large centrifuges should be floor mounted and fixed in position

11) Rotors must be installed correctly on the centrifuge spindle, and any fixing nuts must be tightened (but not over-tightened).

12) The access cover must not be opened until the rotating assembly has stopped.

13) Rotors should be cleaned, dried and stored upside-down after use.

14) All spillages within centrifuges must be cleaned immediately. Spills of hazardous material must be adequately decontaminated.

15) Rotors will be de-rated over time and the recommended speed should not be exceeded.

27.3 Maintenance

1) The apparatus must be disconnected from the power supply before any maintenance can be carried out.
2) Only qualified persons should do maintenance.
3) In order to prevent corrosion, spillages should be removed immediately.
4) The centrifuge chamber, rotors and accessories should be thoroughly cleaned and dried.

Governing Legislation:
Safety, Health and Welfare at Work Act 2005.
Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 2, Chapter 2 – Use of Work Equipment.
Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 3 – Electricity.

28.0 Refrigerators, Freezers & Cold Room Areas

28.1 Hazards

1) Explosion
2) Fire
3) Hazardous Chemicals
4) Slips and falls (cold rooms).

Risk Assessment	Low

28.2 Control Measures

1) Cold storage facilities should be “spark-proof” for volatile solvents.
2) Good housekeeping must be maintained i.e. all loose bottles and tubes must be kept securely in place with tightly sealed lids.
3) All containers must be clearly labelled with the name of the contents, the owner and date.
4) All spills must be cleaned immediately to prevent exposure to personnel using these facilities.
5) Cold rooms must be fitted with non-slip floors.
6) Cold rooms will have a release mechanism on the interior of the door in case of accidental door closure.

Governing Legislation:
Safety, Health and Welfare at Work Act 2005. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 2, Chapter 2 – Use of Work Equipment. Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 3 – Electricity. Chemicals Act 2008.

29.0 Confocal Microscope (CASH Building)

29.1 HAZARDS:

1) Slips, trips and falls
2) Laser Cooling Unit
3) Noise
4) Exposure to Laser Light

Risk Assessment	Low

29.2 CONTROL MEASURES:

1) Ensure all cables, wires, etc for the computer; lasers, microscope and printer are positioned to the rear of the instrument.
2) Do not obstruct cooling fans during operation.
3) Do not tamper with or remove the protective grills on the front of the unit.
4) Ensure adequate room ventilation to dissipate heat.
5) Monitor noise levels periodically to ensure they are within health and safety limits.
6) Appropriate training in the correct use of the equipment will be provided by trained personnel prior to use.
7) Warning labels have been fixed near apertures or moveable parts where exposure to laser light is possible.
8) Do not deviate from published operating or maintenance procedures. Consult the safety guide.

Governing Legislation:
The instrument is designed and manufactured to comply with applicable performance standards for Class 3B laser devices. It is not possible to anticipate every hazardous situation. Therefore, the user must exercise care, common sense and observe all appropriate safety precautions applicable to Class 3B lasers and high-voltage electrical equipment during installation, operation and maintenance.
This device complies with the requirements of both directive 89/336/EEC concerning electromagnetic compatibility and directive 73/23/EEC concerning low voltage. The CE marking indicates compliance with the above directives. The directives are applied based on the conformance to the requirements of technical standards. The standards below are used so as to verify the compliance with the directives.
Safety EN61010-1(2001:2nd Edition): Safety requirements for electrical equipment for measurement, control and laboratory use. Electromagnetic Compatibility EN 61326-1: 2006 / IEC61 326-1:2005: Electrical equipment for measurement, control and laboratory use. EMC requirements EN61326 defines two categories according to the location for use. This system is applied Class A. Laser Safety 1EC60825-1:1 993+A1:1 997+ A2:2001

30.0 Isoelectrical Focusing System.

30.1 HAZARDS:

- Electrical shock

Risk Assessment	Medium

30.2 CONTROL MEASURES:

1) Make sure that the supply voltage at the wall outlet corresponds to the marking on the instrument, before connecting the power cord. The unit must always be connected to a grounded power outlet.
2) Do not block the rear and side panel of the instrument. The Power switch must always be easy to access. The power cord must always be easy to disconnect.
3) Conduct visual check on equipment prior to use.
4) The system has an automatic voltage cut-off when the safety lid is opened.
5) The safety lid must be securely closed before starting a protocol.
6) Operation and user maintenance should be performed by properly trained personnel only.
7) Warning labels have been fixed to the system by the manufacturer.
8) Do not operate in any other way than described in the operating manual. Consult the safety instructions.
9) The instrument covers must not be opened by the user. It contains electrical circuits which can give an electric shock. Service and planned maintenance should be performed by authorized personnel only.

Governing Legislation:
This device complies in conformity with the requirements of the following normative harmonized standards: EN 61326:1997 (A1:1998, A2:2001) EMC requirements for electrical equipment for measurement, control and laboratory use. EN 61010-1:2001 Safety requirements for electrical equipment for measurements, control and laboratory use. following the provisions of EC Directive(s); 89/336/EEC Electromagnetic Compatibility (EMC-Directive). 73/23/EECLow Voltage Directive (LVD).

31.0 2D Electrophoresis System.

HAZARDS

1) Electrical shock
2) Chemical exposure to electrophoresis buffer.

Risk Assessment	Medium

CONTROL MEASURES

1) Wear appropriate PPE to include laboratory coat, latex gloves and safety glasses when handling biological samples and chemicals and loading the gel cassettes onto the electrophoresis system.
2) Read MSDS prior to usage of chemicals.
3) Ensure SDS electrophoresis buffer is not filled beyond the max fill line.
4) The safety lid must be in place before connecting the power leads to a power supply.
5) Turn all power supply controls off and disconnect the power leads before removing the safety lid.
6) Operation and user maintenance should be performed by properly trained personnel only.
7) Because this instrument can develop sufficient volt and current to produce an electric shock, care must be exercised in its operation. Do not operate in any other way than described in the operating manual. Consult the safety instructions.
8) Only accessories and parts approved or supplied by Hoefer, Inc. may be used for operating, maintaining, and servicing this product.

Governing Legislation:
Relevant EC Directives and Harmonized Standards: 2006/95/EC Low Voltage Equipment directive, amended by IEC/EN/UL61010-1 ed2

32.0 Autoflex 111 MALDI. (CASH Building)

HAZARDS

1) Exposure to Laser Light

Risk Assessment	Low

CONTROL MEASURES

1) The MALDI is an electrical piece of equipment for measurement, control, and laboratory use where the electromagnetic environment is kept under control. That means in such an environment transmitting devices such as mobile phones should not be used in the immediate vicinity.
2) The MALDI with the closed safety cover is a Class I Laser product. With the safety cover opened it turns into a Class IV Laser product emitting 355 nm light. The enclosure surrounding the instrument

is designed to protect the user from indirect radiation of the invisible light. Operating the instrument with opened covers can expose the user to harmful laser radiation, which may result in blindness.

3) Never look directly into the laser beam. Always wear safety goggles before opening the side panels. Make sure other people cannot expose themselves to the laser light. Avoid bringing highly reflecting parts into the beam (screw drivers, watches, rings) because the reflected visible and invisible light could reach your eye, causing irreparable injuries.
4) Appropriate training in the correct use of the equipment will be provided by trained personnel prior to use.
5) Do not deviate from published operating procedures. Ensure the safety cover is closed at all times. Service and planned maintenance should be performed by authorized personnel only.

Governing Legislation:
This device complies with the requirements of both directive 89/336/EEC concerning electromagnetic compatibility and directive 73/23/EEC concerning low voltage. The CE marking indicates compliance with the above directives.
Laser Safety 1EC60825-1:1 993+A1:1 997+ A2:2001

33.0 NMR System.

NMR facilities at TU Dublin, Tallaght Campus consist of magnet/sample preparation room, data handling room and staff office.

NMR spectrometers are highly sophisticated and sensitive devices, and hence all the users must work cautiously around the NMR laboratory. Failure to do so can result in costly instrument damage and serious personal injuries which could be fatal. Each user must understand the Hazards: present in the laboratory and follow all the safety practices.

The superconducting magnets attached to the electronic equipments are always on and active. These magnets have very strong static magnetic fields, 300 MHz (70,000 Gauss), 500 MHz (117,000 Gauss) when compared to the earth's magnetic field (0.6 Gauss at equator). The strength of the magnet falls off as you move away from its centre.

NMR facilities, and in particular the magnet/sample preparation room are accessible only to authorised personnel. All the NMR users including postgraduate and especially undergraduate students will have to undertake pre-work training programme prior to being allowed to use the NMR facilities. The use of NMR facilities by undergraduate students must be supervised at all times by NMR staff. Compliance with Good Laboratory Practice is mandatory. No children (babies included) are allowed to enter the NMR labs. All service personnel and visitors must gain permission to access the NMR facility by contacting the NMR Manager.

Hazards

1) Ultra Shield superconducting magnets
- Cryogenic liquids

Risk Assessment	Medium

Control Measures:

1) Warning signs are placed at both entrances to the NMR facility. The strong magnetic field can cause damage to medical implants and pacemakers which could be fatal. Do not enter to the NMR facility if you have any medical implants or pacemakers.
2) Strong magnetic fields can cause damage to personal electronic items (mechanical watches, plastic cards with magnetic strips, mobile phones, metal jewellery etc). These items should not be in a close proximity to the magnets.
3) Strong magnetic fields can attract metal objects which could cause damage to the magnet and cause personal injuries. No DIY tools, metallic objects or portable electronic equipment should be taken closer than 1.5 m to the magnets. Metal objects can be attracted to the magnet. Small, sharp metal objects flying towards the magnet are highly dangerous and can cause personal injury. Larger objects are troublesome to scrape off the magnet, and can seriously damage the magnet. If the objects strike the magnet they can distort magnet's internal structure which can cause the magnet to release its cryogenic liquids in gas form (quench), especially liquid helium.
4) In the unlikely event of the magnet quenching or of a cryogenic failure, up to 100 m^3 of helium gas may evolve over a period of several minutes. In this situation liquid helium expands rapidly and displaces all the air (oxygen) in the room causing asphyxiation. Personnel should evacuate the area in such situation.
5) A quench warranting evacuation would be obvious by the noise of escaping gas and clouds of vapour.
6) The liquid helium (-269º C) and liquid nitrogen (-196º C) used in the magnets are extremely cold. Prolonged contact with liquid nitrogen or brief contact with liquid helium will cause frostbite. Therefore PPE – cryogenic gloves, safety glasses and safety footwear must be worn all the time. If these cryogenic liquids do come into contact with the skin, use warm water (below 40ºC) and never use dry heat. All incidents must be reported.
7) Filling of the magnet with liquid nitrogen and with liquid helium is necessary to maintain the magnet. Failure to refill the magnet when low levels occur may result in a magnet quench.
8) The liquid nitrogen refill of both magnets should be done on a weekly basis. The liquid helium level for each spectrometer is monitored by automatic sensor and helium log files are accessible from the NMR computers. The level of the liquid helium cannot be lower than 55 % for each magnet.
9) Both cryogen refills should be done by trained personnel only. PPE and safety footwear must be worn during the cryogen refill. Doors should be propped open to increase ventilation during the cryogen refill. Since the possibility of a helium quench is higher when filling the magnet, and since the transfer involves manual operations, there is a remote possibility that an operator could be rendered unconscious at the

time of a quench. Transfer must be continuously attended and helium transfer must be done in buddy pairs. Ref 15.0 Cryogens for more details of handling liquid helium and liquid nitrogen respectively.

10) In the event of fire in the NMR facilities use only carbon dioxide fire extinguishers. The fire extinguisher is placed at the wall in the magnet/sample preparation room, left to the entrance.

11) In case of serious flooding or other situations where there is a risk of electrocution, turn off the equipment circuit breakers. These are located at the wall in the magnet/sample preparation room, left to the window.

34.0 FACS Calibur Flow Cytometer,

HAZARDS:

1) Exposure to Laser Light

Risk Assessment	Low

CONTROL MEASURES:

1) For protection against shock, equipment should be connected to an approved power source.
2) Wear appropriate PPE to include laboratory coat, latex gloves and safety glasses when handling biological samples and chemicals. Follow appropriate biosafety procedures.
3) The FACs Calibur instrument is a Class I laser product. The laser is fully contained within the instrument structure but the light may be visible (with difficulty) if the safety cover is opened. Never look directly into the laser beam and always wear safety goggles before opening the safety cover.
4) Appropriate training in the correct use of the equipment will be provided by trained personnel prior to use.
5) Service and planned maintenance should be performed by authorized personnel only.

Governing Legislation:
This device complies with the requirements of directive 89/336/EEC concerning electromagnetic compatibility and conforms to EN 50082-2/EN 55011 Class A Emissions (Heavy Industrial Environment).
They declare that this device complies with the European In Vitro Diagnostic Directive and its relevant transposition into national laws of the member states into which they place the device.

35.0 Bruker Raman Spectrometer – PAT Lab

HAZARDS:

1) Exposure to Laser Light

Risk Assessment	Low

CONTROL MEASURES:

1) The Raman Spectrometer (Bruker Senterra) is an electrical piece of equipment for measurement, control, and laboratory use.
2) The analysis system Senterra is equipped with high energy laser diodes.
3) The lasers when in use emit both visible and invisible laser radiation in the near ir region. These are laser 3B products, governed by the standard EN 60825-1/10.2003
4) The Laser is housed in a specially constructed shield within the system.
5) Always close the safety shield when sampling. (specially designed feature, the laser does not work if the shield is open)
6) Appropriate training in the correct use of the equipment will be provided by trained personnel prior to use.
7) Do not deviate from published operating procedures. Ensure the safety cover is closed at all times. Service and planned maintenance should be performed by authorized personnel only.

Governing Legislation:
This device complies with the requirements of both directive 89/336/EEC concerning electromagnetic compatibility and directive 73/23/EEC concerning low voltage. The CE marking indicates compliance with the above directives. Laser Safety, 1EC60825-1:1 993+A1:1 997+ A2:2001 , EN60825-1/10.2003

36.0 Physics Laboratory and Equipment.

36.1 Uniphase 155SL & Unilab Class II Portable Lasers

36.1.1 HAZARDS:

1) Exposure to Laser Light

Risk Assessment	Low

36.2.2 CONTROL MEASURES:

1) The Uniphase 155SL and Unilab Class II lasers are portable laser systems designed for use in laboratory experiments in second and third level institutions
2) The lasers are class II lasers (see below) which emit visible light with an approximate wavelength of 630 nm
3) There is no danger due to stray light entering the human eye – only prolonged exposure of the eye to a direct laser beam is hazardous (see below).
4) During experiments students handle and operate the lasers. Staff are required to inform students of the potential Hazards: of directly observing the beam
5) When 2 or more lasers are placed on a single workbench they must have the same orientation. This ensures that student groups do not face each other during experiments and lessens the risk of direct exposure to another group's laser beam.

FURTHER INFORMATION

Our lasers are classed in accordance with IEC document 60825-1. This groups lasers into 4 classes the weakest being class I and the strongest class IV. Classes I and II include the M subclass while class III consists of the 3R and 3B subclasses. Class II lasers are only dangerous when direct exposure of the eye lasts in excess of 0.25 seconds. Normally this is impossible due to the corneal reflex. This causes the human eye to blink within 0.25 seconds in response to bright light. Eye damage is only possible in cases conscious suppression of blinking or a neurological disorder affecting the corneal reflex.

36.2 Leslie's Cubes

36.2.1 HAZARDS:

1) Risk of exposure to excessive heat

Risk Assessment	Medium

36.2.2 CONTROL MEASURES:

1) The Leslie's Cube consists of a metal cube containing a domestic light bulb used in the measurement or demonstration of variations in thermal radiation
2) During operation heat from the bulb is transferred to the metal cube and radiation from this metal can be measured
3) There is a small risk of scalding should staff or students touch the metal walls of the cube during operation

4) Cubes should only be handled by staff (students should be informed of this prior to beginning experiments)
5) Cubes should only be handled when not in operation
6) After use they should be unplugged and at least 10 minutes should elapse before staff handle them again.

36.3 Oscilloscopes

36.3.1 HAZARDS

1. Risk of injury due to equipment being dropped while handling

Risk Assessment	Medium

36.3.2 CONTROL MEASURES

1) The Department of Science uses various portable oscilloscopes
2) These oscilloscopes weigh up to 5 kg
3) There is a risk that they could be dropped while being transferred with the attending risk of injury (particularly to a person's feet)
4) Prior to experiments beginning the oscilloscopes should be transferred to the experimental surface by a staff member
5) Student's should not handle the oscilloscopes and be informed of this at the beginning of class
6) When handling the oscilloscopes Ref. 7.0 on manual handling for more information

36.4 Power Supplies

36.4.1 HAZARDS

1. Risk of injury due to equipment being dropped while handling

Risk Assessment	Medium

36.4.2 CONTROL MEASURES

1. The Department of Science uses Unilab Student Power Supplies
2. These power supplies weight approximately 6kg
3. There is a risk that they could be dropped while being transferred with the attending risk of injury (particularly to a person's feet)
4. Prior to experiments beginning the power supplies should be transferred to the experimental surface by a staff member
5. Student's should not handle the power supplies and be informed of this at the beginning of class
6. When handling the power supplies Ref. 7.0 on manual handling for more information.

37.0 Sports Laboratory & Equipment.

37.1 Treadmill

37.1.1 Hazards:

1) Continuous moving belt.
2) Risk of electrical shock if appropriate power cables are not used.
3) Risk of injury from a fall whilst operational.
4) Risk of collapse if subject is unfit or has an underlying medical condition.

Risk Assessment	Medium

37.2.2 Control Measures:

1) Ensure that the subject on the treadmill is wearing suitable running attire and is familiar with all of the controls and emergency stop button.
2) The subject should be asked to declare any underlying medical conditions which may put them at risk from maximal fitness testing and if such a condition exists that they have clearance from their GP to be tested.
3) Subjects undergoing maximal fitness testing should be monitored by another individual. This individual should control the treadmill communicate with the test subject before and during the test to ensure that they are comfortable and aware of what is happening at all times. They should advise them prior to any changes in speed or gradient and inform them if they appear to be moving towards the back of the treadmill towards the end of the test when higher speeds or gradients may be applied and the subject is working close to their physical limits.
4) The use of the treadmill safety harness should be implemented during any maximal fitness testing, to ensure subjects/participants do not fall off the treadmill at high speeds.
5) Ensure that there are no power cables obstructing the moving belt or the running area.
6) Ensure that a minimum distance of 2 meters is maintained from the back of the treadmill and any walls, furniture or other objects and that the floor area behind the treadmill is clear to lessen the severity in the case of a fall.

37.2 Wattbike

37.2.1 Hazards

1) Risk of electrical shock if appropriate power cables are not used.

2) Risk of collapse if subject is unfit or has an underlying medical condition.
3) Risk of back injury if subject is not positioned correctly on the bike.

Risk Assessment	Medium

37.2.2 Control Measures

1) Ensure that the subject on the Wattbike is wearing suitable exercise attire and is comfortable on the bike before commencing any testing.

2) The subject should be asked to declare any underlying medical conditions which may put them at risk from maximal fitness testing and if such a condition exists that they have clearance from their GP to be tested

37.3 Quark CPET

37.3.1 Hazards

1) Risk of electrical shock if appropriate power cables are not used.
2) Risk of explosion of calibration gas cylinder.
3) Risk of a damaged cylinder valve acting as a high-velocity projectile.

Risk Assessment	Medium

37.3.2 Control Measures

1) All staff using compressed gas should be instructed in safe techniques for its use.
2) Calibration gas cylinder should be stored in the correct location on the CPET trolley and secured in place with the accompanying safety belt.
3) Calibration gas valve should be kept closed except during calibration prior to testing.
4) All tubing and regulators used must be compatible with the gas type and working conditions.
5) CPET should only be used by staff that has been fully trained in the operation of the unit.
6) For further information on gas safety refer to section 16.0.

37.4 USE OF LANCETS & BIOLOGICAL SAMPLES

37.4.1 Hazards:

1. Risk of cross contamination with accidental needle stick.

2. Risk of biological samples spills from resulting testing procedures.

Risk Assessment	Medium

37.4.2 Control Measures:

1. Ensure only fully trained personnel use the lancets on human subjects or that students are supervised by such a person.
2. Correct PPE must be worn by the tester (gloves, glasses & coats).
3. Ensure that any used lancets are disposed of in the correct waste bin – i.e. contaminated sharps waste.
4. Ensure any blood spills are disinfected and disposed of in contaminated waste receptacles – autoclave waste bins for any blood contaminated wipes/tissues and sharps for any needles.
5. Ensure that lancets are not re-used. Use a fresh one each time

37.5 USE OF WEIGHTLIFTING EQUIPMENT

37.5.1 Hazards:

1) Potential of dropping weights
2) Potential of bar slipping
3) Can result in injuries

Risk Assessment	Medium

37.5.2 Control Measures:

1) Ensure the use of appropriate safety bars and latches.
2) Ensure exercises are carried out under the supervision of lecturers or post grads along with adequate spotters for any heavy lifting.

37.6 VERTICAL & HORIZONTAL JUMPS

37.6.1 Hazards

1) Falling

2) Can result in injuries

Risk Assessment	Medium

37.6.2 Control Measures

1) Ensure appropriate training on applicable equipment used in these exercises.
2) Ensure enough clearance overhead for vertical jumps
3) Ensure no objects in close proximity for horizontal jumps
4) Ensure only protocols approved by lead lecturer/demonstrator are used.

37.7 GAIT ANALYSIS

37.1.1 Hazards

1) Person walking/running into object, person or wall.
2) Can result in injuries to the participant

Risk Assessment	Medium

37.1.2 Control Measures

1) Ensure appropriate training and operating guidelines
2) Ensure there is adequate distance for individuals to decelerate.
3) Ensure that the end of the optojump equipment is clear of objects and individuals.

38.0 Pharmaceutical Lab 009 and Equipment.

The Pharmaceutical Laboratory (Lab 009) was Risk assessed at the time of project completion circa 2003. The documentation was prepared by PM Group, Killakee House, Belgard Square, Tallaght, Dublin 24.

Reference documentation:
Tallaght IT HAZOP Report PM Project No: 010596 Document No: 010596-23-RP-001 File No: 010596-23-014

Tallaght IT Health and Safety Risk Assessment Report
PM Project No: 010596 Document No: 010596-23-RP-002 File No: 010596-23-016

Table 9.0

I:\DATA\Chemistry_Technicians\Health & Safety

The Equipment listed in Table 10 (page 80) was assessed in the HAZOP and the Health and Safety Report In 2003 reference documentation above. In the interim period additional equipment has been added to the laboratory:

38.1 Fermentation Vessels
38.2 Westfalia Centrifuge
38.3 2L Quad Fermenters
38.4 Millipore M30 Tangential Flow Filtration Unit

Table of equipment and associated drawing numbers from Tallaght IT HAZOP Report

System		
Number	**Description**	**P&ID**
1	Mixing Skid - DI Water Addition to Chemical Intake Tank	00095-01-002, Rev J 00095-01-010, Rev 3 00095-01-005, Rev 0
2	Mixing Skid - Chemical Intake Tank Discharge System	00095-01-002, Rev J 00095-01-005, Rev 1
3	Mixing Skid - Pre-Mix Tanks	00095-01-002, Rev J
4	Mixing Skid - Pre-Mix Tanks Steam & Condensate	00095-01-002, Rev J 00095-01-006, Rev 4
5	Mixing Skid - Sugar Addition to Tri - Blender	00095-01-002, Rev J
6	Mixing Skid - Holding Tank	00095-01-002, Rev J
7	CIP / SIP Skid	00095-01-001, Rev 3 00095-01-002, Rev 0
8	Instrument Skid	00095-01-004, Rev 0
9	Steam to Clean Generator	00095-01-007, Rev 1
10	Clean Steam Generator	00095-01-007, Rev 1
11	Two Tonne Boiler Steam Generation	00095-01-006, Rev 4 00095-01-002, Rev1
12	Two Tonne Boiler Blow down	00095-01-006, Rev 4
13	Gas Supply to 2 Tonne Boiler	00095-01-006, Rev 4
14	Air Compressor	00095-01-009, Rev 3
15	DI Water	00095-01-010, Rev 3
16	Waste System	00095-01-005, Rev 1
17	Filling Line	No Drawings Available

Table 10.0

Additional Equipment:

38.1 Fermentation Vessels

The suite of Fermentation Vessels includes:

1) 10L Fermenter
2) 100L Media Tank
3) 100L Fermentation Vessel
4) 100L Holding Tank

Hazards:

1) Hot Surfaces
2) High pressure
3) Biological Hazards:

Risk Assessment	Medium

Control Measures

1) Surfaces on the vessels are thermally insulated to prevent burns. Any surfaces that are not possible to insulate are clearly labelled with “Hot Surface” stickers. The area is also labelled and cordoned off during sterilisation processes to prevent and personnel from touching the vessel.
2) Pressure (1-2bar) does occur in the vessels during sterilisation and some processes, the vessels are fitted with pressure relief valves rated for 3bar to protect personnel and equipment. These relief valves are inspected and certified every year as part of the insurance requirements.
3) Biological materials used are Generally Recognised as Safe (GRAS) for most procedures. Personnel using the equipment and biological materials are trained and have a qualification in the relevant discipline for handling biologics and use correct aseptic technique.

38.2 Westfalia Centrifuge

Hazards:

1) Hot Surfaces
2) Noise
3) Biological Materials

Risk Assessment	Medium

Control Measures:

1) As above; surfaces on the centrifuge are thermally insulated where possible to prevent burns. Any surfaces that are not possible to insulate are clearly labelled with “Hot Surface” stickers. The area is also labelled and cordoned off during sterilisation processes to prevent and personnel from touching the vessel.

2) The centrifuge is noisy when in operation, ear protection is provided to any personnel working with the centrifuge for long periods.

3) Biological materials used are Generally Recognised as Safe (GRAS) for most procedures. Personnel using the equipment and biological materials are trained and have a qualification in the relevant discipline for handling biologics and use correct aseptic technique.

38.3 2L Quad Fermenters

Hazards:

1. Biological Materials
2. Manual Handling

Risk Assessment	Low

Hazards:

1. Biological materials used are Generally Recognised as Safe (GRAS) for most procedures. Personnel using the equipment and biological materials are trained and have a qualification in the relevant discipline for handling biologics and use correct aseptic technique.
2. The 2L fermenters are sterilised in an autoclave, there is some manual handling involved, personnel using the equipment will have had manual training to complete these tasks.

38.4 Millipore M30 Tangential Flow Filtration Unit

Hazards:

1. Biological Materials
2. Chemical Hazards:

Risk Assessment	Low

Control Measures:

1. Biological materials used are Generally Recognised as Safe (GRAS) for most procedures. Personnel using the equipment and biological materials are trained and have a qualification in the relevant discipline for handling biologics and use correct aseptic technique.
2. A dilute caustic solution is used to clean the filter, personal protective equipment (PPE) is worn at all times this includes safety glasses, gloves and Laboratory safety coat, this protects against any splashes that may occur.

Appendix 1.0: Emergency Evacuation.

EVACUATION PROCEDURES

When the ***ALARM*** sounds

1. LEAVE THE BUILDING **IMMEDIATELY** BY THE **NEAREST** EXIT
2. CLOSE THE DOOR OF THE ROOM YOU VACATE
3. DO **NOT** USE THE LIFT
4. DO **NOT** RE-ENTER THE PREMISES FOR ANY REASON
5. **GO** TO THE NEAREST ASSEMBLY POINT
6. DO **NOT** LEAVE THE ASSEMBLY POINT UNTIL THE ALL CLEAR HAS BEEN GIVEN – 3 blasts of Air-horn

All staff, including those in control of students and visitors, must instruct them to vacate the premises in an orderly manner, and direct them to the nearest assembly point, using the nearest available escape route.

- ***Familiarise yourself with the green evacuation signs in the corridors and with the location of the various assembly points.***
- ***Ensure that you are familiar with the fire exits***
- ***Ensure that you are familiar with the assembly points as shown on the attached drawing.***
- ***Keep the roadways around the building clear.***
- ***Do not attempt to leave the grounds during the course of a drill/evacuation.***

Fire exits have signs designating which assembly point is to be used for that exit. Nobody, **Staff, Student or Visitor**, should leave the assembly point until the all-clear is given.

Fire Wardens have been appointed on each floor to ensure that all rooms have been cleared.

A control centre, with a designated Incident Controller (one of the caretakers), will operate outside the main entrance. The person that activates the alarm must report directly to the Incident Controller and they should ensure that the Emergency Services are contacted.

An Evacuation Report is to be subsequently completed by the Incident Controller.

The silencing of the alarm does not indicate the all clear to re-enter the building.
The All Clear is signaled by three blasts from an Air-Horn

Target evacuation time 2.5 minutes

Appendix 2.0: Emergency Telephone Numbers.

Emergency Telephone Numbers	
Student Health Centre	Ext 2613
Orlagh / Michelle – Nurses	Ext 2613
Dr. Siobhan Kierans GP	Ext 4590962
Tallaght Hospital	4142000
Emergency Services	112
Poison Information Centre – Beaumont Hospital	8379964 / 8379966
Tallaght Gardai	4511333
Caretakers (to be notified if ambulance called)	2601 / 2610
First Aid Personnel – (With Defibrillator Training)	
Science Department	**Ext**
Hugh Gallagher – CASH Building	2506
David Saville – Chemistry	2414
Eleana Dunne – Biology	2154
Deborah Collins – Biology	2365
Aine McParland – Biology / Chemistry	2414
Buildings	
Mark Parle –Buildings Officer	2139
Martin Stafford – Caretaker	2610
IT Services	
Paul Butler – Webmaster	2829
Derek Trout	2513
Robbie Galvin	2148
Sports	
Tim O'Connor – Sports Officer	2550
Gerry Anderson	2551
Student Services	
Brendan Harte	2131
Sinead Reddy	2654
Engineering	
Eamonn Quigley	2837
Paul Tierney	2393

Appendix 3.0: Out of Hours Access Request Form.

Department of Applied Science

OUT OF HOURS ACCESS REQUEST FORM

This from must be completed in full by the Academic Supervisor for each Postgraduate Student or Researcher requiring Lone / Out of Hours Access.
The Department defines out of hours work during the academic year as any laboratory/experimental work undertaken outside of the hours of 08.00 to 21.00 Monday to Thursday inclusive, 08.00 to 18.00 on Fridays, and 08.00 to 14.00 on Saturdays. Outside of the academic year, out of hours is defined as work outside of the hours of 09.00 to 18.00 Monday to Friday inclusive.

Name of Researcher (*print*):			Contact No:
Supervisor's Name (*print*):			Contact No:
Laboratory location of work:			
Time and duration of work:	From:	To:	
Day & date work is to be done:	Day:	Date:	
Brief description of work (*Use continuation sheet if needed*):			

RISK ASSESSMENT			
Co-Worker Required			Yes: No:
Name of Co-Worker			Signature:
Do you suffer from any medical condition that makes you unsuitable for lone working?			Yes: No:
Risk Category*	**Identify specific Hazards:**		
Work approved by supervisor (*tick appropriate box*):			Yes: No:
Signatures:	Researcher:		Date:
	Supervisor:		Date:
	Estates Manager:		Date:
	Security:		Date:

Department of Applied Science

OUT OF HOURS ACCESS REQUEST FORM - Continuation Sheet

Brief description of work (*for the general reader; continuation sheet*):		
Name of Researcher(*print*):		Ext:
Signature:		Ext:

Risk Categories

Project supervisors should categorise proposed experimental work into the following risk categories:

A: Those tasks that may only be undertaken with close senior supervision. Category A risk's are deemed unacceptable outside of normal working hours 09.00 – 17.30 Monday – Friday.

B: High risk activities to be carried out only by experienced researchers with a competent partner in attendance.

C: Medium risk activities to be carried out by sufficiently competent researchers (may or may not require a partner) including any experimental work with some risks (other than A and B) where care must be observed but it is considered that workers are adequately trained and competent in the procedures involved to be able to work alone. C risk activities require some training beyond undergraduate level but should form a large part of the normal "background" of daily business and fall outside of Category D.

D: Low risk activities to be carried out by any postgraduate student, researcher, or staff member including general laboratory practices which include all procedures covered in undergraduate teaching laboratories.

E: Those tasks which, even without training, carry very low levels of risk e.g. work that is purely theoretical or computational in nature.

Appendix 4.0: Undergraduate Overnight Experiment Form.

OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
DUBLIN
TECHNOLOGICAL UNIVERSITY DUBLIN

UNDERGRATUATE OVERNIGHT EXPERIMENT FORM

Laboratory:	
Under graduate Student Name:	
Contact numbers (in case of Emergency):	Daytime: Evening
Time and Date started:	Estimated Finish Date:
Supervisor's Name:	
Supervisor's Contact number:	Daytime: Evening:
Full Description of Experiment **in plain English**. (Include **full names** of all chemicals/solvents used. Do **not** use any acronyms (e.g. DCM, THF, etc.). Draw the full reaction scheme (where applicable).	
Procedure in the event of an emergency (**Use Plain English**, remember this is likely to be read by Security or other non-scientific Personnel):	
This form should be left beside your reaction. Failure to fill out the form in full will result in your reaction being switched off.	
Class / Project Supervisor:	
Date:	

[1] In the case of undergraduate students, contact numbers should be given for the project / laboratory supervisor only. Undergraduate students would not be deemed to have sufficient knowledge to deal with an uncontrolled reaction.

Appendix 5.0: Postgraduate Overnight Experiment Form.

OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
DUBLIN
TECHNOLOGICAL UNIVERSITY DUBLIN

POSTGRATUATE OVERNIGHT EXPERIMENT FORM

Laboratory:	
Post graduate Student Name:	
Contact numbers (in case of Emergency):	Daytime: Evening
Time and Date started:	Estimated Finish Date:
Supervisor's Name:	
Supervisor's Contact number:	Daytime: Evening:
Full Description of Experiment **in plain English**. (Include **full names** of all chemicals/solvents used. Do **not** use any acronyms (e.g. DCM, THF, etc.). Draw the full reaction scheme (where applicable).	
Procedure in the event of an emergency (**Use Plain English**, remember this is likely to be read by Security or other non-scientific Personnel):	
This form should be left beside your reaction. Failure to fill out the form in full will result in your reaction being switched off.	
Class / Project Supervisor:	
Date:	

Appendix 6.0: Chemical Agents Risk Assessment Form.

Chemical Agent & CMR Risk Assessment Form[1]

Title of Activity:	**Issue Date:**
Course Title & Module:	
Location (Lab where activity will be carried out):	**Review Date:**
Assessment carried out by:	

1. Table(1) of chemicals used and relavent safety information[2]

Substance name	*CAS no*	*Conc*[3]	*Amt used*	*Hazard Classification*	Hazard statement / Risk phrase	*Route of exposure e.g Inhalation, Eyes, Skin, Ingestion*	*Frequency of use*[4]	*Duration of exposure Minutes, hours*	*OELV*[5]

2. Evaluation of potential exposure to Category 1A or 1B or Category 2(GHS) (Class 1,2 or 3)(GHS) Carcinogens, Mutagens and Reproductive (CMRs)Toxins

If any chemical listed in Table 1 belong to CMR classification have alternatives been considered. Please give details below and
justify why Category 1A and 1B (Class 1or 2) will be used.

1 = As required by the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001)
2 = Waste and products of reaction must also be listed.
3 = Conc = concentration (%,N ,M, ppm etc))
4 =

Frequency of Use	Indicative Criteria
Occasional	Use averaging less than 2 hours per week over an extended period or use on a small number of occasions (less than 10) after which use will cease
Frequent	Regular daily use for 1-2 hours per day or less or Regular use for several hours on one or two working days per week
Continuous	Use for several hours per day on all or a majority of working days

5 OELV = occupational exposure limit as set down in the most up to date Code of Practice for the Chemical Agents Regulations. If unavailable use TLV or equivalent

If a CMR is used, is the exposure below the OELV and are users informed of the hazard associated with such a chemical

Is occupational monitoring required to ensure that the control of exposure to the hazardous substance(s) is adequate?	**Yes / No**	**No**
Is health surveillance required?		
Have you recorded the use of CMR and exposures to CMRs in the CMR Log Book.		

3. Circumstances of work involving the chemical agents

Please specify[6,7]

4. Storage and Transport

The procedures for storage and transport of the chemical should be outlined here:-

5. Disposal of Waste.

The procedure for disposal of all waste should be outlined clearly here:-

6. Persons directly or indirectly involved in the work activity who may be exposed[8].

Identify any persons in the following groups, directly or indirectly involved with the work activity,that may be at risk from the Hazards: of the activity.

Academic staff		Undergraduate students		Maintenance staff		Administration Staff	
Technical staff		Laboratory attendants		Emergency personnel		Contractors	
Postgraduate students		Cleaning staff		Visitors			

7. Preventative or Hazards: currently in place in addition to those outlined in the manual/SOP e.g. safety

instruction given at start of practical work, restrictions on who can carry out task etc.

Should any extra training be given to carry out the task(s) safely. If yes please specify below	**Yes / No**	**No**

[6] Please specify the page number and undergraduate laboratory manual edition as appropriate

[7] If not an undergraduate practical the relevant SOP or procedure must be attached

[8] *Persons identified above may require to be informed of the information contained in this risk assessment.*

Specific training Requirement

8. Engineering Hazards:

	Yes	No
The work can be carried out safely on the open bench		
The work must be carried out in a fume cupboard(s)		
Where engineering controls are used e.g. fume cupboards, Weighsafe Cabinet, LEV etc. are these subject to a formal performance test, at least every 12 months, and records kept? *If no, this must be arranged.*		
Is air monitoring required to ensure that the control of exposure to the hazardous substance(s) is adequate?		

9. Personal Protective Equipment (PPE)

If adequate control of exposure to the hazardous substance(s) cannot be achieved by substitution or engineering controls the following type(s) of PPE will be required (in addition to the standard laboratory coat and glasses) for part or all of the activity.

Hand protection		Respiratory protection		Face protection		
Specify the grade(s) of PPE to be worn:						
Specify when during the activity the item(s) of PPE must be worn:						

10. Activity where there is a foreseeable potential for significant exposure

List any activities such as maintenance of equipment, spillage etc where there could be significant exposure[9].

11.Emergency Procedures[10].

In the event of an emergency the procedures must be documented:- Fire, Chemical Spills(small and large). Please consider failure of services(Fume-hood, water, electricity etc)

Are there special first aid measures required in the event of exposure to any of the above? Yes/No (If yes please outline below)

[9] Spillage of small amounts may not lead to significant exposure. In general spills < 250ml or 500g would be considered small. However, the chemical/
physical
properties of the substance should be taken into account when assessing the potential risk of exposure.

[10] Please refer to the School Safety Statement for general emergency procedures

12. Is anyone pregnant or belonging to a sensitive risk group (Pregnant, breastfeeding, or underlying Medical Condition (that could be exacerbated by exposure to chemicals). **Yes/No**

If so has a 'person specific' risk assessment been undertaken in association with the Head of Department -Yes/No

13. Is Specific Health Surveillance Required? **Yes/No** (If yes please outline below) (CMRs and Sensitisers)

14. Risk Assessment

Risk assessment is based on the likelihood or probability of a person or persons being exposed to a chemical or chemicals, combined with an estimation of how harmful the outcome of the exposure would be to a person or persons.

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 you have gathered and the Hazards: or preventative measures that are currently in
place, what is your estimation of the risk.

Risk Assessment with current Hazards: in place =

15. Risk Assessment Approval

If the risk assessment is completed in conjunction with a postgraduate or Project student the supervisor must review it and both must sign below.

Student/Postgraduate Student: _____

Academic Staff/ Head of Department: _____

Date ___/____/_ _

Appendix 7.0: SOP for Emergency Laboratory Evacuation in Case of Escape of Potentially Hazardous Material.

STANDARD OPERATING PROCEDURE

Organisation: TUDublin, Tallaght Campus

Faculty: School of Science

Protocol Name: Emergency Laboratory Evacuation in Case of Escape of Potentially Hazardous Material

Protocol No.: Sci-X-010

Revision: A

Prepared by: John Behan

Date: 04/06/2019

Approved by: John Behan

Date: 04/06/2019

REVISION HISTORY

Rev.	Reason for change	Effective from	Prepared by & date	Approved by & date	Description of change
A					

1.0 POLICY

It is the policy of the School of Science that in the case of an emergency arising due to the escape of potentially hazardous material that immediate action is taken to prevent or minimise exposure of all persons to this material. In the case of such an occurrence, taking immediate appropriate action must be given priority over all other activities.

2.0 PURPOSE

The purpose of this protocol is to outline to School of Science staff and research students what immediate action should be taken upon spilling, discovering a spillage or smelling any potentially hazardous material. It describes first step measures to be taken to evacuate and secure a lab under such circumstances. This action should be taken by any person who spills or discovers a spill or smell of any potentially harmful material.

3.0 ORGANISATIONAL UNITS AFFECTED

School of Science

4.0 DEFINITIONS

For the purposes of this document Potentially Hazardous Material is taken to mean any chemical or biological material that has or may have any known or unknown associated hazard due to exposure or inhalation. This does not include materials that are known to be safe. If in doubt about any material or unusual smell it must be treated as potentially hazardous. Common everyday chemicals may pose a risk in larger quantities or when not properly contained.

5.0 RESPONSIBILITY

It is the responsibility of the Head of School of Science, Head of Department of Applied Science to ensure compliance to this protocol.

6.0 DESCRIPTION OF PROCEDURE

6.1 Upon spilling or discovering a spill or smell of any potentially harmful material in a lab initiate a lab evacuation as follows.

6.1.1 Inform all persons present in the lab of the spill and ensure that they evacuate immediately.

6.1.2 Report all non-compliance to HOD / HOS.

6.1.3 Leave the lab yourself by the nearest exit closing the door behind you.

6.2 Prevent re-entry to the lab.

6.2.1 Shut all other entry / exit doors from the outside.

6.2.2 Each lab is supplied with its own set of A3 signs warning that the lab is closed and entry is prohibited. Place one of these in a prominent position on each door into the lab.

6.2.2.1 These signs should be stored beside the main exit to the lab and picked up on leaving the lab.

6.2.3 Under no circumstances must any person return to the lab without appropriate PPE.

6.2.3.1 Report all breaches to HOD / HOS.

6.3 Contact a relevant technician for the area to deal with the spill.

6.3.1 Give them details of the nature of the substance, its location, the quantities and any other information that may be of use.

6.3.1.1 Do not withhold any information that may put them or anybody else in danger.

6.4 The lab may be reopened after a suitable time frame and when deemed safe to do so by the HOD / HOS and / or relevant technicians and supervisors.

7.0 REVISION OF THIS PROTOCOL

7.1 Where an error, omission, or possible improvement to this protocol is identified by any member of staff, that information should be brought to the attention of the HOD / HOS as soon as possible in order that this protocol may be revised immediately.

7.2 This protocol will be subject to review at the end of each academic year to reflect any change in University, School, or Department policy or any identified error, omission, or improvement.

Appendix 8.0: Biological Agents Risk Assessment Form.

Biological Agents Risk Assessment Form[1]
Persons completing this form should refer to the ITT Biosafety Manual

1. General Information

Title of Activity / Practical	
Course & Module Title	
Name of Assessor	
Status of Assessor	
Date of Assessment	
Location of Work & Room number	

2. Detail the Process Involving the use or risk of Exposure to Biological Agents
Indicate the frequency and duration of the process, the materials to be handled & who will be carrying it out. If necessary attach a written procedure for the process.

3. Details of Biological Agent

Name of Agent	
Type of Agent (Bacteria, virus, etc.)	
Class of Agent (Class 1-4) [2]	
Is Use Likely to Lead to Genetic recombination or gene alteration / mutation[3]	
New or Existing Culture	

4. Containment [4]

Containment Measures for Class 2 Biological agents	Requirement	Implemented-Yes/No
❖ Access is to be restricted to nominated workers only	Recommended	
❖ Specific disinfection procedures	Yes, for bench	
❖ Surfaces impervious to water & easy to clean. Use of white containment trays	Yes	
❖ Effective vector control -Keep doors & windows closed	Recommended	
❖ Surfaces resistant to acids, alkali, solvents, disinfectants	Recommended	
❖ Safe storage of a biological agent	Yes	
❖ Infected material including any animal is to be handled in a safety cabinet or isolator or other suitable containment	Where appropriate	
❖ Autoclave / incineration of the biohazardous waste & provision of appropriate bins / autoclave bags	Recommended	

Note : 1: As required by the Safety, Health and Welfare at Work (Biological Agents) Regulations 2013 (S.I. No. 572 of 2013) & The Safety, Health and Welfare at Work (General Application) Regulations, 2007
2 : Persons must inform the Health & Safety Authority(HSA) of the use of a biological agent thirty days prior to the Commencement of work involving its ***use for the first time****, applicable for class 2-4.*
3 : If "yes" please inform the EPA
4. Code of Practice Biological Agents SI 572 of 2013 – Schedule 1

5. Is specialist training required before this process commences? Yes □ No □
If yes, please detail

6. List persons likely to be Exposed to biological Agents (Tick more than 1 if applicable) **:**

Technician	
Supervisor	
Postgraduate	
Undergraduate	

7. Indicate Potential Routes of Exposure (Tick more than 1 if applicable)

Ingestion of the Agent	
Inhalation of the Agent	
Entry via Mucosal Membranes	
Entry via Damaged Skin	
Subcutaneous Entry	
Physical Containment	

8. Potential Health Effects of Biological Agent(s)

10.0 Risk

9.0 Risk Hazards: to Allow Safe use of Agents(s)

9.1 PPE Required

Lab Coat	
Safety Goggles	
Gloves	
Safety Glasses	
Face Shield	
Other (give details)	

9.2 Engineering Controls Required
Safety Cabinet □ Other (give details)_____

9.3 Emergency Responses
First Aid Responses

9.4 Spill Responses & Suitable Disinfectant

9.5 Good Hygiene Practices
Students advised of the following – please tick as appropriate :

No Eating or Drinking in Work Place	
Hand Washing Facilities Available	
Mandatory Washing of Exposed Skin after Work Completed	
Covering of Cuts & Abrasions	
No Insertion of Objects into Mouths etc	

9.6 Vaccination Required No □ Yes (give details)_____
9.7 Further Risk Hazards: required to Eliminate / Minimise Identified Routes of Exposure.

The following should be considered:

The design of work practices so as to minimise potential for contact with biological agents

On-going health screening for affected persons if deemed necessary

The display of warning notices where necessary

The keeping of adequate records of persons potentially exposed to infectious agents where deemed necessary

The drawing up of plans to deal with accidents involving a biological agent.

The use of means for the safe collection, storage and disposal of waste by employees, including the use of secure and identifiable containers, after suitable treatment where appropriate.

The making of arrangements for the safe handling and transport of a biological agent within the workplace.

The removal of sharps from the workplace

The implementation of Universal Precautions for handling blood products

The restriction of access to the workplace

Pregnant employees

Equipment requirements

Sharps issues

Lab animal issues

Additional hygiene Hazards:

10. Disposal of Waste.
The procedure for disposal of all waste should be outlined clearly here:-

11. Risk Assessment
Risk assessment is based on the likelihood or probability of a person or persons being exposed to a biological agent, combined with an estimation of how harmful the outcome of the exposure would be to a person or persons.

likelihood of exposure / *Result of exposure*	**Unlikely**	***Likely***	***Very 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

- Insignificant risk :No further action needed
- Low Risk :No additional risk Hazards: required
- Medium Risk :Implement further risk Hazards: if possible
- High Risk :Further Hazards: must be implemented. If this is not possible then work must be strictly managed to ensure safety.
- Unacceptably High Risk:Work must be prohibited until further Hazards: are implemented.

Taking into account the information you have gathered and the Hazards: or preventative measures that are currently in place, what is your estimation of the risk.

- **Risk Assessment with current Hazards: in place =**
  Is the risk rating acceptable: Yes □ No □

12. Risk Assessment Approval

If the risk assessment is completed in conjunction with a postgraduate or Project student the supervisor must review it and both must sign below.

Student/Postgraduate Student: _____

Academic Staff/ Head of Department: _____ Date ___/____/