

Health and Safety in the Undergraduate Teaching Laboratory

1. General

All work in the school of chemistry is covered by the Health and Safety at Work etc. Act 1974 (<http://www.hse.gov.uk/legislation/hswa.htm>). The school's safety policy and regulations are described in detail in the school safety handbook, available for consultation on the school of chemistry web site. Select the "Intranet" tab and then the "Health & Safety" menu <https://chemhealthandsafety.wp.st-andrews.ac.uk/>

2. Evacuation Procedure

The building is equipped with an automatic alarm system activated by automatic sensors and break-glass units. When the alarm sounds (continuous siren) immediate evacuation of the building is called for.

When the alarm sounds

- (a) Shut off gas burners and electrical heaters (lower lab jacks if in use). Make safe other equipment where this can be done quickly and without personal risk.
- (b) Leave the building immediately by the nearest Fire Exit, and proceed to the grass verge at the front door of the Gateway Building
- (c) **DO NOT:**
 - stop to collect coats, bags and other personal belongings
 - use lifts
 - run (except in a life-threatening situation)
 - enter a smoke-filled stairwell (use alternative exit)
 - re-enter the building until told to do so by the academic in charge
- (d) **DO:**
 - close doors behind you.
 - Stay with the academic in charge of the laboratory session at the assembly point in the event of an evacuation.

Note: In order to test the alarm system, the fire alarm may **sound for up to 10 seconds at 12:55 each Wednesday**. In this case, do not leave unless the alarm sounds for more than 10 seconds. At all other times, leave immediately.

3. Appropriate Clothing and Personal Protection Equipment (PPE)

It is important to be aware that PPE does not completely eliminate the hazards encountered in a laboratory environment.

3.1. Appropriate and Inappropriate Clothing

In the laboratory you should wear clothing that fully covers your arms and legs and good stout shoes should also be worn. **Sandals or open shoes (even with socks), shorts, skirts, tights or dresses are NOT appropriate** since the skin could be exposed to corrosive and/or toxic chemicals and could be exposed to broken glass. Long hair should be tied back to avoid contact with open flames, chemical spillages or becoming entangled in moving parts of machinery.

3.2. Eye Protection

The Personal Protective Equipment at Work Regulations (1992) place a statutory requirement on the School to ensure that all persons within its precincts have their eyes adequately protected. **In the undergraduate laboratories, the wearing of eye protection is mandatory at all times.** Persons who normally wear eyeglasses must also wear safety glasses over their glasses or have prescription safety glasses. Normal spectacles do not provide appropriate splash and impact protection.

The wearing of contact lenses is not banned in the laboratory however it is **strongly discouraged**. This is because any chemical in vapour or liquid form entering the eye may penetrate behind the lens and be difficult to wash out. First-aid workers must be aware of any contact lens wearers so that they can take appropriate action in an emergency. **If you intend to wear contact lenses in the laboratory at any time, you must inform the lab management such that your name is added the list at the beginning of the session.**

3.3. Laboratory Coats

Laboratory coats provide protection for the wearer from contamination by the chemicals encountered in the teaching laboratory. **In the undergraduate laboratories, the wearing of laboratory coats is mandatory at all times.** The wearing of laboratory coats in areas outside the laboratory (in the computer “wedge” area outside the laboratory for example) lecture theatres the library or and social spaces, i.e. cafeteria or chemistry common room in the Purdie building is forbidden. They should be taken off when leaving the laboratory and stored in a locker.

3.4. Gloves

The laboratory environment can present a variety of hazards that may necessitate the use of gloves, examples include: handling corrosives, toxic materials, solvents that can be absorbed rapidly through the skin, certain sharp materials and very cold/very hot objects.

No single type of glove is suitable for all eventualities, however in many teaching laboratory situations nitrile or vinyl gloves are sufficient. The risk assessment or laboratory manual procedure (if appropriate) will direct the user to the appropriate

glove for a particular operation. Full details for chemical compatibilities of different types of gloves are usually available from the manufacturer.

It **SHOULD NOT** be assumed that gloves provide an impervious barrier and continuous use of a single pair of gloves can result in chemical exposure without the user being aware (this is particularly the case with substances with long breakthrough times/slow rates of permeation). The wearer should be aware that cross-contamination to other objects (such as doors, laboratory manuals, computer keyboards etc.) can occur by inappropriate use of gloves. Gloves should be removed and replaced when they become contaminated. Gloves that have been contaminated **MUST** be made safe before disposal. **Misuse of gloves could harm you or other workers in the laboratory.** While they provide a degree of protection for the wearer, careless/inappropriate use of gloves may increase the likelihood of accidental exposure of other people in the vicinity to substances in use.

Allergies to Glove Materials – It is not uncommon to be allergic to certain glove materials, latex being perhaps the most common. If you have a known allergy to glove materials, you should notify a member of staff before proceeding with any laboratory work that requires hand protection.

Any person that refuses to follow the PPE regime outlined will be excluded from the laboratory and could be awarded a mark of 0 for failing to complete the relevant experiment. The person(s) involved will be sent to discuss the situation with the School Safety Coordinator and/or the Head of School.

3.5. Use of Electronic Devices

This guidance applies to mobile phones and other portable electronic devices such as tablets and laptops. The pervasive use of smart phones and other portable electronic devices in the teaching labs may present a hazard, not only for the owner of the device, but for others in the work area. These following guidelines must be observed.

Uses of electronic devices permitted within the School of Chemistry teaching labs:

- Use as a calculator.
- Use as a timer.
- Used to search suitable internet sources for information e.g., NOMAD, Moodle. Use of social media, mobile games etc. is strictly forbidden.
- Use as a camera for taking photos of reaction set ups, products etc. for use in lab reports. You are not permitted to take photos of any person without obtaining their permission.
- Any other safe/appropriate use agreed with the supervisor in charge of the relevant laboratory class.

Contamination:

In all Chemistry labs the risk of contamination must be carefully considered. Phones and devices may be taken into the lab area, but **must not be:**

- Handled with gloved hands, potentially contaminated hands.
- Placed within a fume cupboard.

- Placed on contaminated bench surfaces.

You must ensure the bench surface is CLEAN before you place your belongings on it. On no account must phones or devices be handled if there is any possibility of contamination. It is often difficult to tell whether gloves are contaminated, and hence this should always be assumed.

Phones are often held near the mouth and eyes, which are more susceptible to infection or damage following contamination with chemical agents. Having to take gloves off repeatedly to use mobile devices potentially increases the likelihood of a lapse in concentration that would allow skin to come in contact with contaminants on the gloves.

Distraction:

Mobile phones can be a severe distraction, which is why it is illegal to use a handheld mobile when driving. They may also distract people, which may result in an accident during a safety critical process. Phones must be turned to silent if kept on one's person.

Fire risk:

Portable electronic devices contain Li-ion batteries. These batteries contain no free lithium metal but do contain lithium ions and highly flammable electrolytes. Devices should be kept well away from sources of ignition or equipment that may risk damaging the integrity of the battery. Devices may NOT be charged in the teaching labs unless the charger and device itself has been PAT tested by the University.

Listening to music through earbuds/headphones:

Portable music devices (mp3 players, iPods etc.) are strictly forbidden from use in the teaching labs as per the guidance in the School of Chemistry Safety Handbook as they are a significant source of distraction. Using your mobile electronic device to listen to music is also forbidden.

4. Chemical Hazards

The toxicological properties of many chemicals used in the School of Chemistry have not been fully investigated. All chemicals should be treated as potentially hazardous. As required by the Control of Substances Hazardous to Health (COSHH) Regulations (2002), the degree of hazard associated with each substance in use in the undergraduate laboratories has been assessed.

The result of the Hazard Assessment is expressed as a hazard rating according to the following five-point scale:

5 = highly hazardous	4 = hazardous
3 = moderate hazard	2 = low hazard
1 = no significant hazard	

The nature of the hazard(s) involved is also indicated by adding letters as follows:

A = corrosive or irritant	C = carcinogenic
F = flammable	M = mutagenic
O = oxidising agent	P = prohibited
R = radioactive	T = toxic
X = explosive	

All containers of chemicals are marked with the hazard assessment code. All students must note the hazard rating of each substance they are to use and take the appropriate precautions.

As required by the Control of Substances Hazardous to Health Regulations (1999) and the Management of Health and Safety at Work Regulations (1992), a written risk assessment has been carried out for each experiment and is available for consultation in the laboratory. Students should always consult the risk assessment before beginning an experiment, although special precautions needed for individual experiments are described in the Laboratory Manual. Always read the procedure carefully, and if you are in any doubt consult a demonstrator.

It is forbidden to carry out any unauthorized experiment. It is forbidden to remove any chemical substance, sample, or item of equipment from the laboratories. Any student found doing this will be subject to severe penalties up to and including exclusion from the University.

5. Accidents

If an accident occurs in the laboratory inform the Laboratory Supervisor or a demonstrator immediately so that the necessary action can be taken.

6. Waste Disposal

Due to health, safety, environmental and legal concerns **it is essential that laboratory waste is properly segregated and disposed of.** School policy is laid

down in the Health & Safety booklet available on the web site. Practices applying to the small-scale work in the teaching laboratory are outlined below and specific disposal instructions accompany many experiments and procedures but, **if at any time you are in any doubt, please consult a member of the laboratory staff for advice.**

6.1. Glass and ceramics

ALL waste glass and ceramics must be decontaminated and deposited in the specially marked waste glass bins. NOTE IN PARTICULAR that pipettes, melting point tubes, broken glass or ceramics **MUST NOT** be left on the bench or in any sink or pedal bin.

6.2. Sharps

A plastic container is provided in the preparation room for disposal of non-glass sharps, such as needles and knife blades.

6.3. General waste

Decontaminated harmless general waste can go in the pedal bins provided for ordinary refuse collection. The following materials may typically be disposed of in pedal bins: Aluminium foil, cotton wool, glass wool, paper, plastics, and rubber.

6.4. Chemical spillages

You MUST attend to your spillages promptly.

As well as damaging the work surfaces and expensive instrumentation (notably balances!) unidentifiable heaps and puddles left by you are an extraordinary health and disposal problem for other people. Only you know what you've spilled, only you can arrange appropriate disposal.

6.5. Powders

A "controlled waste" container for DRY, DECONTAMINATED low-hazard powders is provided in the overnight fume cupboard. This is for powders only and is not for disposal of filter papers or cotton wool. **NO chemical waste or powder (e.g. samples, chromatography supports, filter aid, charcoal, clay) is to be disposed of in the pedal bins.**

6.6. Inorganic chemical waste

Low-hazard water-soluble waste such as acids, alkalis, and decontaminated drying agents (CaCl_2 , MgSO_4 , K_2CO_3 , Na_2SO_4) can be flushed down a sink with plenty of water. Low to moderate-hazard insoluble inorganic waste (e.g. alumina, silica, charcoal, Celite/Hyflo, BaSO_4 , soda-lime) **must be** deposited in the controlled waste container. Toxic waste must be deposited in the appropriate labelled container.

6.7. Organic chemical waste

NOTE: This includes organic samples and solvents but **NOT** solutions of organic compounds in water.

ORGANIC SOLVENTS MUST NEVER BE POURED DOWN THE SINK!!!

Separate containers are provided for halogenated and non-halogenated ORGANIC waste. This is ultimately disposed of by combustion, when it is important that acid forming waste (halogenated) is treated separately. A dangerous reaction may occur if the two types are mixed or become contaminated with oxidising agents, strong acids, strong bases, or metal compounds. If you have a mixture, neutralise, if necessary, then recover, for disposal, the organic portion by distillation (rotary evaporator) or extraction, disposing of the inorganic fraction separately.

ORGANIC phosphorus and sulfur compounds also form acids on combustion and are disposed of with the halogenated ORGANIC waste. This waste bottle is kept in a fume cupboard, as it is also used for the disposal of malodorous compounds such as pyridines and amines.

The following must **NOT** be put into these waste bottles:

INORGANIC halides, e.g. bromine, calcium chloride, hydrochloric acid, iodine, phosphorus chlorides, potassium bromide, sodium chloride, thionyl chloride. Halogens, reactive non-metal halides and organic acid chlorides must be cautiously hydrolysed and/or neutralised (consult a demonstrator) then flushed down the sink with plenty of water.

Any person that refuses to follow the disposal procedures outlined could be excluded from the laboratory and could be awarded a mark of 0 for failing to complete the relevant experiment. The person(s) involved will be sent to discuss the situation with the School Safety Coordinator and/or the Head of School.

7. New and Expectant Mothers

Under the Management of Health and Safety at Work (Amendment) Regulations 1994, relating to new and expectant mothers, a special assessment has to be carried out in respect of the work activities of any new or expectant mother. Any student who becomes pregnant or has had a baby in the last 6 months should inform the Laboratory Supervisor in confidence as soon as possible so that the required assessment can be carried out.

SIGNATURE

**Dr K. Jones
Environmental Health and Safety Manager**

DATE

SIGNATURE

**Prof. C. J. Baddeley
Head of School of Chemistry**

DATE

Equality, Diversity & Inclusion

The University and School of Chemistry are committed to supporting equality and diversity in all aspects of its activity. Everyone has the right to study and work in a supportive, tolerant environment free from discrimination and harassment, regardless of gender, race, religion, disability, ethnicity, or sexual identity/orientation. To support us in this, if you are subject to, or witness, discrimination, or harassment of any kind, **please make this known to us**. This can be through a member of Chemistry staff (your advisor of studies, tutor, or any other member of staff); alternatively, you can raise the issue with student services.