SCHOOL OF CHEMISTRY
RISK ASSESSMENT

This form must be completed by a competent Assessor for any procedure/system of work carried out by staff, undergraduates, postgraduates, postdoctoral workers or visitor before an attempt is made at the procedure/system of work. Reference should be made to the instructions for making a Risk Assessment in the current School Safety Manual.

Name of Individual : **Date of assessment: 11th September 2013**
Status of Individual: **Laboratory/Room number**

Review date: 10th September 2014 or on significant change or after an accident

Activity being assessed:
General laboratory activities carried out in a Chemistry Laboratory

Known or foreseeable hazards associated with the activity

(A) Environment
(1) General

- Contact with chemicals.
- Fire (burns).
- Smoke (inhalation, diminished visibility, lachrymatory).
- Slips, trips or falls.
- Using Stairs (trips and falls, dropping loads, spillages)
- Piped gases – natural gas - flammable atmospheres; inert gases, asphyxiation.
- Manual Handling (strains and sprains, trapped or crushed body parts, back problems).
- Use of Display Screen Equipment (repetitive strain injuries, eye strain, back problems).
- Falling objects.
- Structural elements, integrity of fume hoods, state of ducting, benching, flooring, lighting, provision of fresh water, waste water drainage etc.).
- Electricity.
- Poor waste management.
- Poor housekeeping leading to potential hazards being hidden.
- Building work and Contractors travelling through the building with equipment etc.

(2) Hygiene and Welfare

- Poor hygiene (not washing hands, constant wearing of gloves) can result in skin irritation and dermatitis.
- Accidental ingestion of chemicals (from nail biting, handling chewing gum, chewing pen tops etc.)
- Deliberate ingestion of chemicals
- Drinking unwholesome water.
- Not drinking enough water in hot weather.

(B) Materials
(1) Chemicals, more specific hazards to be assessed in the Control of Substances Hazardous to Health (COSHH) Regulations (and the Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) if appropriate) assessments

General chemical handling

- Inhalation of hazardous chemical fumes.
- Contact with skin, eyes – toxic, corrosive, irritant etc. depending on the chemical.

- Contamination of surfaces by inappropriate use of gloves.
- Ingestion of chemicals.

Chemical Spillages

- Creation of slip hazards if spilled on floor.
- Damage to floor coverings (embrittlement – trip hazard, or tackiness – fall hazard).

(2) Solvents

- Solvent spillage – asphyxiation from solvent fumes; toxic, corrosive irritant contact with skin; damage to floor coverings, work and other surfaces.
- Possible formation of explosive atmospheres.
- Highly flammable and flammable materials that would provide fuel and promote fire spread.

(3) Use of cryogenic materials (See separate document and assessment for filling dewars from bulk storage)

- Cold burns.
- Asphyxiation.
- Formation of liquid oxygen-explosive in sealed glassware, promotes rapid combustion
- Formation of liquid argon-explosive in sealed glassware
- Embrittlement of equipment, including fume hood bases, linoleum flooring.
- Nuisance noise when filling dewars in the loading bay.

(C) Equipment

(1) Electrical hazards

- Burns.
- Shock.
- Arcing.
- Fire.
- Explosion.

(2) Rotary Evaporators

- Burns, scalds from hot water, bath, steam.
- Possible growth of Legionella in water baths and infection of users from water droplets spread by spinning sample.
- Organic solvent fire.
- Exposure to chemicals.
- Explosion / breakage due to pressure build up or vacuum.
- Implosion upon application of vacuum.
- Handling glassware – risk of cuts.
- Electrical hazards.
- Flooding
- Fire

(3) Vacuum Lines

- Implosion upon application of vacuum.
- Use of liquid nitrogen – cold burns, embrittlement of equipment / flesh after submersion in liquid nitrogen, asphyxiation.
- Build up of liquid oxygen which could be an explosion risk if this is in contact with other chemicals/materials (e.g. grease, hydrocarbons).
- Static electricity build up on metal frames.

(4) Vacuum pumps

- Electrical hazards.
- Inhalation of oil and / or chemical vapour.
- Oil leaks – slips and degradation of floor covering.
- Mechanical hazards – entanglement in moving parts, entrapment in spindles / belts and contact with rotating parts of rotary pumps.
- Smoke.
- Noise.
- Fire.
- Storage of chemicals, paper and equipment in cupboards where vacuum pumps are situated increasing the likelihood of fire.
- Manual handling when moving equipment for repair.

(5) Ovens, hotplates and heating mantles (see separate assessment for hot air guns)

- Burns, scalds.
- Inhalation of hazardous chemical fumes.
- Fire.
- Electrical hazards.

(6) Bunsen burners

- Burns.
- Fire.
- Natural gas (creation of explosive atmosphere, asphyxiation).

(7) Heating baths (can be steam, sand, glycerol, oil, Woods metal etc.)

- Scalds.
- Burns.
- Legionella in water baths.
- Smoke.
- Fire.
- Chemical inhalation.
- Electrical hazards associated with the heater.
- Manual handling for large, full baths.
- Entanglement, entrapment or contact with moving propellers or other mechanical methods of mixing the contents.

(8) Thermometers

There are two types in common use in the Chemistry building, liquid in glass and thermocouples.

- The glass can break in the liquid and glass thermometers – resulting in liberation of the liquid component, which is commonly mercury, a toxic metal.
- Glass cuts from the broken thermometer.
- Contact with the hot or cold bulb which may cause burns.
- Thermocouples are powered by electricity so all electrical hazards may be present.

(9) Ultrasonic baths

- Ultrasound which may cause release of trapped gases in body fluid in living tissue immersed in a switched on bath which could cause health effects up to and including death.
- Nuisance noise.
- Legionella.
- Electrical Hazards.

(10) Glassware and sharps, including hypodermic needles

- Cuts, as glassware is brittle and liable to break as a result of temperature changes, knocks and whe stoppers are inserted.
- Glass is slippery when wet and more liable to be dropped.
- Puncture wounds and embedded material from flying glass fragments as glass can explode when under pressure or implode under vacuum.
- Puncture wounds and scratches with possible injection of chemicals.
- Spurting of volatile and/or pyrophoric liquids from syringes and cannulae.

(11) Ultraviolet lamps and transilluminators

Exposure to UV light

- Causes eye/skin damage – burns to the retina, corneal or conjunctival irritation.
- Corrosive causing skin burns.
- Can cause premature skin aging.
- Can promote the onset of cancer.
- Effects more marked in individuals exposed to photosensitizing agents (e.g. some drugs taken orally, topically applied creams etc.).
- Electrical hazards.

(12) Microwave Ovens

- Microwave radiation can cause damage to internal organs if it leaks out of the appliance.
- Burns or scalds from hot liquids.
- Electrical hazards.
- Explosion if lids are tightly secured on vessels.

(13) X-Ray Diffractometers

- Ionising radiation.
- Electrical hazards.
- Chemical hazards (when using the solid state equipment in particular).
- Cryogenics.
- Hazards associated with Display Screen Equipment.

(14) Nuclear Magnetic Resonance, Electron Paramagnetic Resonance Spectrometers and Mass Spectrometry

- Effects of a strong magnetic field (5G) can be lethal for people with heart pacemakers and ferromagnetic implants.
- Can wipe magnetic information (credit/debit/university staff cards, magnetic key fobs etc.).
- Can damage watches.
- Can damage mobile phones.
- Chemical hazards.
- Work at height (use of ladders to place sample in magnet or autosampler).
- Contact with robotic arms / pincers / carousels from moving autosampler.
- Electrical hazards.
- Cryogenic hazards.
- Asphyxiation
- Other hazards as described on the specific risk assessment associated with work in areas of high magnetic fields for those involved in servicing and maintenance of the spectrometers.

(15) Spectrometers and analytical instrumentation

- Electrical hazards.
- Exposure to chemicals, especially in High Performance Liquid Chromatography (HPLC), Gel

Permeation Chromatography (GPC) and Chemical Ionisation processes in Mass Spectrometery.
- Exposure to non-ionising radiation.
- Thermal hazards (very hot, very cold).
- Hazards associated with Display Screen Equipment.

(16) Compressed gases
- Asphyxiation.
- Creation of flammable atmospheres.
- Manual handling injury.
- Potential physical damage to premises, equipment and people.
- Possible noise if the gas is at high pressure and flow rate.
- Unsecured hoses lashing as a result of excessive flow rate knocking items over.
- Release of fittings at high velocity causing contact injuries

(17) Personal Protective Equipment (PPE)
- Increased exposure due to wrong equipment being selected (e.g. gloves, wrong type of safety glasses etc.).
- Increased exposure due to equipment not fitting properly.
- Increased likelihood of contact with chemicals due to incorrect sequence of removing several items of equipment.
- Fails to danger.
- Incompatibility of equipment can lead to more unsafe conditions.
- Only protects the wearer, and then, only if correctly selected, fitting, and worn.

(18) High pressure reaction vessels (e.g. acid digestion bombs)
- Ejection of contents due to excessive temperature.
- Ejection of contents due to excessive pressure.
- Ejection of contents due to excessive loading.
- Ejection of contents due to the presence of explosive materials.
- Leakage of contents due to poor sealing of lid.
- Burns, scalds.
- Cracking of ceramic fume hood base due to thermal shock.

(19) Centrifuges
- Manual handling injuries if rotors are dropped or lifted.
- Hand/arm injuries if centrifuges are opened and rotors touched before they stop spinning
- Serious contact injury to anyone in the event of mechanical failure at speed due to possible violent movement of the machine or escape of a rotor.
- Knocking over other equipment if the centrifuge starts to ‘walk’ due to imbalance.
- Spillage of materials when loading buckets or due to faulty seals on buckets.
- Electrical hazards

(***D) People***
- Working alone / out of hours when there is reduced help in the event of an emergency.
- Inappropriate behaviour (running, not listening, not working to protocol).
- People who are under the influence of alcohol or drugs.
- People who have been poorly trained.
- Awareness that the realisation of hazards (risks) may be increased for vulnerable groups, e.g. the young, those with physical or mental difficulties, pregnant or nursing females.
- Clothing (or lack of) that can increase the risks of: slips, trips and falls, contact injuries from chemicals, heat, or cryogens.

- Long, loose hair, ties and jewellery that can increase risks of becoming entangled in equipment, get caught with flames, increase hazards associated with laser radiation and possible reflections, heat etc.

The risk of injury high (H), medium (M), low (L) and its severity likely to arise from these hazards (see later (or follow the link) for the matrix used to work this out:

(A) Environment
(1)-L, 4; (2)-L, 3

(B) Materials
(1)-H, 9; (2)-H, 9; (3)-H, 9

(C) Equipment
(1)-L, 4; (2)-M, 6: (3)-M, 6; (4)-M, 6; (5)-L, 4; (6)-M, 6; (7)-M, 6; (8)-L, 2; (9)-L,4; (10)-M, 2; (11)-M, 6; (12)-L, 3; (13)-L, 3; (14)-M, 8; (15)-L, 3; (16)-M, 8; (17)-M, 6; (18)-M, 6; (19)-M, 6

(D) People
M, 6

Who is at risk?

Individuals in the Laboratory, including undergraduates, postgraduates, technicians, visitors, cleaning and maintenance staff

Control measures to be taken to reduce the level of risk:

These are general guidelines and are not exhaustive. Refer also to laboratory practical work manuals, the School Safety Manual and/or specific Procedures and Methods sheets and general risk assessments available on the School of Chemistry intranet site under health and safety information. **http://intranet.chemistry.manchester.ac.uk/intranet/health/**

(A) Environment
(1) General
Contact with chemicals

- Wear lab coat and safety spectacles when in a laboratory (even if you are just visiting or passing through) unless a separate risk assessment indicates that this is not necessary (this may be the case in some instrument labs).
- Use other protective equipment (e.g. appropriate gloves, blast screens, full face visors, aprons, wellingtons) if required by the specific Chemical Risk Assessment (CRA) or specific Control of Substances Hazardous to Health (COSHH) assessment.
- When submitting samples for analysis by any of the services (Microanalysis, Separations, Mass Spectrometry, Nuclear Magnetic Resonance Spectroscopy, X-Ray Diffraction etc.) ensure that the chemical hazard information is completed on the service submission documents.
- Ensure that samples submitted to the services are collected from the service laboratory and properly disposed of.

Fire hazards

- Keep solvents and flammable materials storage to a minimum.
- Store flammable materials in the designated storage areas, **do not** leave on the benches or floor.

- Ensure solvents are stored in trays or bunded cupboards.
- Do not store incompatible chemicals in the same cupboard.
- Know where fire fighting equipment is kept and be able to use it when you have been trained.
- Know the fire evacuation procedure – evacuate on continuous fire alarm, do not use lifts.
- Evacuate the building using the designated fire escapes.
- Keep fire escape routes free from any obstacles these will be checked periodically by the SSA.
- Ensure all occupants are aware of the location of the fire escapes.
- Meet on the grassed area in front of the Zochonis building.
- Note that the fire alarms are tested on Wednesday at 13.40 hours and report any audibility problems to the SSA (internal 57851).
- Note that there is automatic fire detection in the building.
- Red manual fire alarm call points are situated in all corridors and on all stairwells, they are labeled fire call point – break glass to activate.
- Advise the SSA of the location of any compressed gas cylinder added to a lab inventory.

Smoke

- Should be detected automatically, if not, use manual call points.
- Leave area by nearest fire exit, and evacuate as in fire situation.
- Put damp cloth over nose and mouth and exit area whilst keeping close to the floor if smoke is intense.
- Ensure any overheating equipment is switched off and either notified to the lab technician or supervisor or taken directly for repair.
- Carry out any chemical reactions that are known to generate smoke and fumes in a well ventilated area (e.g. fume hood).

Slips, trips, and falls

- Keep bags and coats either put away in lockers or stored towards the perimeter of the room, or under desks away from main traffic routes (not under the safety showers).
- Put unused equipment, solvents and chemicals away in the designated spaces, don't abandon these items on the floor.
- Clear up chemical and water spills immediately.
- Ensure that trailing leads, tubing etc. are kept as short as practicable and are secured/coiled to prevent them becoming trip hazards or trailing into sinks.
- Report any damaged flooring, lighting etc. to either the lab technician or the SSA's office - internal 57851/60577 or direct to the Estates Helpdesk – internal 52424. If the fault is reported direct to the Estates Helpdesk, please make a note of the job reference number and let SSA have the details so that progress on the job can be followed through to completion.

Use of stairs

- Ensure stair lights are on.
- Use handrail.
- Do not run up or down stairs.
- Check for obstacles or spillages on the stairs before use.
- When stairs are being cleaned, note the appropriate warning signs used.
- If carrying a load, ensure that this does not obstruct vision or prevent use of the handrail.
- Use the Goods lift if moving a load vertically through the building . Note - dangerous items (e.g. toxic chemical, cryogens, solvents, compressed gases) should not travel accompanied and warning signs must be placed in the lift.
- If a load is dropped or spilled, if possible remove the hazard immediately, or ensure the area is blocked or roped off and warning signs are placed until the spillage is cleared.
- Report loose handrails, damaged steps, failed lighting to the Estates Helpdesk, internal 52424,

or the SSA's office internal 57851/60577 (Research labs) immediately. If the fault is reported direct to the Estates Helpdesk, please make a note of the job reference number and let the SSA have the details so that progress on the job can be followed through to completion.
- If there is a problem, complete an accident/incident form and return it to the SSA.

Piped gases

Natural gas

- Use only when people are present, with recognised equipment (e.g. Bunsen burners).
- Turn off when not in use and if fire alarm sounds.
- Be aware there is an automatic shut-off point for teaching lab supplies operated by technical staff.
- Report any smells of gas to the SSA office (57851, 60577) or reception immediately.

Inert gases

- Use only in fume hoods, areas connected to local exhaust ventilation, or other well ventilated areas.
- Include consideration of the physical properties (lighter/denser than air) and any hazards that may arise from these when you complete your Chemical Risk Assessment .
- Download, read and sign the Procedures and Methods Sheet on Compressed gases from the School intranet.
- Check that pressures in regulators are not excessive and flow rates are kept at the minimum level.

Manual Handling

- Transport Winchester bottles of solvents only in Winchester carriers or bunded trolleys.
- Do not pick up bottles by the cap – this may be loose, or the neck, as this may break under the strain and support the bottom of the bottle when lifting.
- Particularly noxious chemicals must not be transported in the lift and should be in double containment.
- Where possible, use trolleys to transport materials from delivery point to point of use (essential for gas cylinders).
- If the hoist is required when collecting solvents from the solvents store, ensure you have been trained in its correct use.
- Do not travel in either the goods or passenger lift with compressed gases, dry ice, liquid nitrogen or large amounts of solvent – call the goods lift, load it, press the destination button, the leave the lift and close the doors from outside and meet the lift at the destination floor. Display a notice that forbids anyone to enter the lift whilst this material is being carried. A supply of these notices is available, free of charge, from the Chemistry Stores.
- Do not enter a lift if it contains any of the listed items.
- Reduce the weight or shape of the load if possible to make it easier to handle.
- For large moving tasks, ensure a manual handling risk assessment has been carried out, that the movers have been properly trained and that appropriate PPE is worn.
- Don't struggle, ask for help - there is a lot of expertise and special equipment available (Mechanical Workshop, internal 54584, or the SSA, internal 57851).

Display Screen Equipment (DSE) – Basic reminders

- Download the generic assessment for office based activities, read it, abide by the control measures identified therein and sign it.
- If you are using DSE for over 1 hour a day, please complete a DSE workstation assessment checklist (from the School Health and safety intranet) and ensure the results are sent to the SSA. Any problems will be followed up with personal contact.

- Alternate your work tasks so you can take regular breaks and can stand/stretch (by drinking plenty of water you will ensure you take sufficient breaks!)
- Stare into the distance for a few seconds after each 30 minutes of continuous use of a display screen.
- Note there is additional guidance on the University Health and Safety intranet site.
- For users of DSE, there is a University eye screening programme.Contact the SSA for details.
- Any symptoms of pain felt after using DSE should be reported to the SSA as soon as possible.

Falling Objects

- If storage is required above head height, ensure that lighter materials (not chemicals) are stored on these shelves.
- Use lipped shelves or other restraints to prevent items falling when , for example, mobile shelving is used.
- When removing or returning objects to high shelves, use proper step ladders or step stools and ensure you have been trained in their use and have understood, downloaded and signed the risk assessment on the intranet.
- Ensure there is someone there to pass items to or receive them from to minimize ascent and descent of the steps.
- If flooding has occurred or roof tiles are crumbling, and it is safe to do so, clear the area and prevent further access. Advise the SSA's office (57851/60577) of the nature of the problem immediately.
- Only buy filing cabinets fitted with a device to only allow one drawer to be removed at a time or with an alternative anti-tilt device. If existing filing cabinets do not comply, please contact the SSA (internal 57851).
- Ensure that free standing bookshelves, when heavily loaded, are fastened securely to a wall.

Structural Elements

- Ensure that faults connected with the fabric of the laboratory (fume hoods – difficulties moving the sashes, cracked bases, broken sashes, glass panes, lack of suction etc., flooring bubbling, fraying or cracking, lights not working, damaged benching, electricity supplies, cable trunking, water supplies, blocked sinks, leaking sinks, dripping taps etc.) are either reported to the laboratory technician or academic in charge of the lab (Teaching labs), direct to the Estates Helpdesk, internal 52424, or the SSA's office internal 57851/60577 (Research labs) immediately. If the fault is reported direct to the Estates Helpdesk, please make a note of the job reference number and let the SSA have the details so that progress on the job can be followed through to completion.
- Download, read and sign the Procedures and Methods sheet for the correct use of fume hoods. (Researchers), undergraduates will be taught how to use the hoods by their demonstrators or academic lab supervisor.
- Safety Champions are responsible for completing a monthly checklist regarding the state of the areas for which they have responsibility and returning this to the SSA.
- Safety showers and eyewashes must be run for two minutes once a week by either the technician SEO in charge (Teaching/Service Labs) or the lab occupants (Research labs) to prevent build up of Legionella bacteria.
- Any queries regarding asbestos should be addressed to the SSA in the first instance – the University has an asbestos register that must be kept up to date.
- Equipment that may contain asbestos must be disposed of via the SSA.

Electrical safety

- All portable appliances are marked, registered and checked annually by a trained and competent person.
- Electrical installations are checked by Estates every 8 years.

- Do not use any mains powered equipment that doesn't have an electrical safety testing label at all or with an out of date electrical safety testing label – contact ext. 60577 to arrange testing.
- Do not use equipment with broken plugs, damaged (burned, cracked) leads, exposed inner wiring
- Ensure that when any connections/adjustments to circuits are made the power is turned off, or reduced to minimum.
- Switch off the appliance and the socket (preferably unplug also) when you have finished using the equipment.
- Report faulty equipment to either the Lab technicians or the Service Provider (Teaching and Services labs) or to the Electronics Workshop (54641), or via the booking in computer in room G.17.

Poor Waste Management

- Ensure waste disposal is undertaken according to the Procedures and Methods sheet and the specific risk assessment published on the School of Chemistry Health and Safety intranet.
- Dispose of waste on a timely basis.

Housekeeping

- Keep work areas uncluttered, put things away when you have finished with them.
- Clear up spills immediately – you know what you have spilled and the effects it may have, others won't.
- Do not clutter fume hood sashes with graffiti – there are whiteboards provided for this purpose.

Building Work

- Obey any prohibition signs.
- Respect any access restrictions to areas in the building where contractors are working

(2) Hygiene and Welfare

- Wash hands when leaving the laboratory.
- Wash gloves when the application for which they have been worn has been completed. Remove them carefully, not touching the parts that have come into contact with chemicals with your hands. Wash hands
- Discard disposable gloves, turned inside out (as you take them off) in waste bins, wash hands.
- Remove lab coats when leaving the laboratory for clean areas (any contamination on the lab coat will then stay in the lab.).
- Use the laundry service to keep your lab. coat clean (contact the SSA, ext. 57851 or House Services Staff, ext 54591 for procedures).
- Do not write or draw on lab coats – this may mask chemical contamination which needs to be noticed and looks unprofessional.
- Ensure gloves selected are appropriate for the use to which they are to be put (see PPE section).
- Do not eat or drink when in the laboratory (this includes biting nails, chewing pens etc.).
- Do not apply make-up in the laboratory.
- Drink only water that comes from taps labeled as drinking water, or from a dispenser (and not from lab. taps).
- Toilets are provided with hot and cold running water and towels, any defects or shortages must be notified to either the House Services staff (ext. 54591) or the SSA (ext 57851).

(B) Materials

(1) Chemicals

General Chemical Handling (Refer also to Procedures and Methods Sheet 001)

- Wear lab coat and safety glasses (proper enclosed goggles if contact lenses are worn and if syringes and cannulae or chemicals under pressure are being used) when in laboratories unless a specific risk assessment indicated that this measure is unnecessary.
- Chemical Risk Assessments (CRA) must be completed and countersigned by an authorized person before reactions and procedures commence. If the assessment has been carried out by someone else, everyone who may be affected by the significant findings must be apprised about the results of the assessments and any controls required to reduce the risks to a safe or acceptable level.
- Be aware of the hazards posed by the chemicals being used – if terms are used in the manufacturer's safety data sheets that you don't understand, look them up, or ask.
- Keep a laboratory inventory of all chemicals in the laboratory.
- Label all samples clearly with your name, the name of the sample, quantity and the date on which it was prepared.
- Any cupboards, fridges or freezers that contain chemicals must display appropriate hazard warning signs.
- Use a fume cupboard when the chemical risk assessment requires it.
- Use of substances which are oxidizing, explosive, pyrophoric, extremely flammable / highly flammable and flammable may need an additional assessment under the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR). Any controls identified in this assessment must also be implemented.
- Do not take anything by mouth when in the laboratory (including chewing pens, finger nails etc.).
- Tell your tutor, supervisor or academic advisor if you need any help.
- Ensure gloves and laboratory coats are removed as you leave the laboratory (unless you are carrying chemicals, in which case remove one glove so you have a clean hand for opening doors, operating light switches etc.
- Apply the principles of good hygiene (see (A) (2) above).

Chemical spillage

- Spills must be cleared up immediately if this can be done safely. Absorbent materials, including booms, mats and pads are stored in the Emergency Cupboards. Once used, these should be packed in the bags provided in the spill kits and be disposed of via Stores as hazardous waste.
- If the spills cannot be cleared up safely, or/ and the substances are extremely, highly or flammable, toxic, corrosive etc. immediately evacuate the area and inform the SSA (ext. 57851).
- Yellow warning signs are available from House Services warning of slip hazards until the spill is cleared.
- Damage to floor coverings, whether they are embrittled or tackified must be reported to the SSA's office (ext. 57851/60577).

(2) Solvents

Spillages

- In the event of small spillage (less than 500mL), if safe / possible to do so, open windows, doors, set fume hoods on purge to aid with clearing the solvent fumes. Switch off electrical equipment. Evacuate laboratory if appropriate based on the toxicity of the solvent.
- Use absorbent materials in the emergency cupboards to clear up, bag waste and disposed of through solvent stores.
- Advise the SSA to replenish the supplies in the emergency cupboard.
- Large spillages – turn off any gas or electricity supplies and evacuate the area. Contact the SSA (57851) immediately.
- When working with solvents keep them away from naked flames or sparks – and have awareness of what others working in the vicinity are doing.
- Store minimum quantities of solvent in the work area (maximum 50L of extremely, highly or flammable solvents – including waste).

Possible formation of explosive atmospheres

- Keep solvent bottles, including wastes, lightly capped unless they are being filled or decanted from.
- When large volumes of solvent are required, work must not commence until a specific assessment of the likelihood of generation of an explosive atmosphere is be carried out and suitable controls are in place.
- Work in fume hood or other well ventilated area.
- Abide by the procedures in the Procedures and Methods Sheet on Solvents on the School Intranet.

Fire

- Keep only small quantities of solvent on work benches and in stock bottles (500 ml maximum). The stock bottles must display the hazard warning labels appropriate to the bottle content, as well as the contents being correctly labeled.
- Store Winchesters in metal cupboards, preferably vented into the extract system.
- Ensure the solvent cupboards are bunded or that the shelves are lipped to contain spillages.
- Keep quantities of solvent bottles to a minimum, and replenish daily from the solvent stores.
- When collecting waste solvents, ensure that acidic wastes are not held in metal cans before being bulked up in solvent stores.
- Keep incompatible wastes chlorinated/non-chlorinated solvents/acids/bases apart.

(3) Use of cryogenic materials

- Ensure appropriate personal protective equipment is used and wear thermal gloves with ribbed cuff, not open cuffed gauntlets, to avoid cold burns.
- Do not wear clothing with turned up cuffs in which liquid nitrogen could pool and cause burns.
- Work in fume hood or well ventilated area.
- Liquid nitrogen will cause liquid oxygen (recognizable as a turquoise-blue liquid) to condense out of air, which in turn may cause the ignition of organic materials (e.g. grease), or a physical explosion.
- The cooling of equipment containing argon by liquid nitrogen will cause liquid argon to condense. This can then be explosive due to the physical increase in pressure if the apparatus is sealed and then allowed to warm up as in a freeze / thaw cycle. Freeze only equipment under vacuum or isolated from the argon supply.
- Dry ice (cardice, solid carbon dioxide) and liquid nitrogen, when placed on ceramic surfaces unprotected by insulation can cause ceramic materials to crack – e.g. fume hood bases. Please ensure that bags of dry ice, in particular, are not left in direct contact with fume hood bases.
- Use only the Goods lift for transporting cryogenic materials.
- Do not accompany either dry ice or liquid nitrogen when it is being transported in the lift – load the lift, select the destination floor, display the warning signs forbidding passengers to use the lift whilst these materials are being transported, close the doors and arrange for the lift to be met at the destination floor.
- Download and work to the guidance in the Procedures and Methods Sheet on use of cryogenic materials.
- In areas where cryogenic materials are dispensed and used in quantity, there is an oxygen depletion monitor installed. Vacate the area if audible alarms and the red strobe lights start flashing. Contact the SSA immediately. Do not re-enter the area until the area is declared safe.
- Hearing protection is available for use in the Loading bay whilst dewars are being filled (no action levels are being breached but there is an acknowledged nuisance factor).

(C) Equipment

(1) Electrical Hazards

- All mains powered electrical equipment must be tested for electrical safety before its first use – contact ext. 60577 to arrange.
- All mains powered electrical equipment must have an in-date electrical safety testing label.
- Inspect equipment before use, do not use anything that has broken plugs, damaged (burned, cracked, melted) leads or exposed inner wiring – report it either to the laboratory technician, demonstrator or academic supervisor (Teaching / Service Labs) or take it to the Electronics Workshop, 4.16, ext. 54641 (Research Labs).
- Ensure that when any connections/adjustments are made to circuits or equipment, the power is turned off, or reduced to a minimum.
- Ensure that you have been trained in the use of the equipment or have a manual which can be referred to.
- Switch off the appliance and the socket (it is also good practice to unplug) when the equipment is not in use.
- Do not touch electrical switches with wet hands.

(2) Rotary Evaporators

- Ensure equipment has been electrically tested and this is still in date, leads are undamaged with no central cores showing, leads coiled out of the way and positioned away from water supplies and undamaged plugs.
- Check that the vacuum tubing is not perished and that it is the appropriate pressure tubing. Replace if necessary.
- Check that the tubing for the cooling water is either nylon, PTFE or pressure tubing (thin walled rubber tubing is not appropriate). Replace if necessary.
- Check for blockages in the tubing during the experiment.
- Ensure that the condenser and receiving flask are both either netted or taped or constructed from 'safebreak' glass.
- Ensure that all pieces of glassware being used in the process are sound – no cracks, chips, jagged edges – replace if necessary.
- Keep ground glass joints clean or lightly greased, use joint clips to secure joints and support the flask containing the product when the system is returned to room pressure.
- Do not hold the sample containing flask as it is rotating as failure of the flask could cause extensive lacerations.
- Do not leave the rotary evaporator running unattended.
- Keep organic solvents and residues away from electrical leads etc.
- Chemical exposure should be controlled by measures identified in the chemical risk assessment, with double trapping if the distillate is very volatile.
- Allow residues to cool if they have been heated before letting air back into the system, or use inert gases if required.
- Ensure that the water bath is fully emptied and cleaned out at least once a month.
- Rotary evaporators are designed for use with a vacuum to achieve a distillation of solvent at a lower boiling point that at ambient pressure – ensure vacuum is on.
- Use minimum heat in the water bath to achieve a steady distillation rate.
- Stop the flask spinning before raising it from the water bath to minimize droplets in the air.
- Empty the receiver flask into the correct solvent disposal container after use (the next user will not know what the solvent is and may introduce something which is incompatible).
- Empty catchpots on the diaphragm pumps before starting work.
- When using very volatile solvents use an additional cold trap, and stand the receiver flask associated with the diaphragm pump condenser in a ice/salt bath.
- Ensure the exhaust from the pump is vented into the fume hood if the whole apparatus cannot be situated in the fume hood.
- Wear lab coat and safety goggles.
- Ensure connections to water (both inlet and outlet) are of pressure or nylon tubing and that the

tubing is clipped or wired on to the tap and apparatus and that the outlet water tube is secured in the sink/drip cup.
- Ensure that the sink drain or drip cup is unblocked before turning on the water.

(3) Vacuum Lines
- Ensure apparatus is visually checked for cracks, chips, blockages, jagged edges before each use – replace if necessary.
- Ensure protective net/tape is covering the vacuum line at all times.
- Do not leave taps open from the vacuum line to atmosphere when the pump is operating.
- Remove liquid nitrogen dewar from the cold trap before opening the vacuum line to atmosphere.
- Allow items that have been in contact with liquid nitrogen to warm up to room temperature gradually and avoid knocking them.
- Use liquid nitrogen in the fume hoods. If there is a large spillage > 500ml out of the fume hood, evacuate the laboratory.
- Use a blast shield when working under high vacuum.
- Wear lab coat and safety goggles.
- Vacuum lines that are mounted on a metal frame should be earthed.

(4) Vacuum Pumps
- Electrical hazard control measures [C(1)] all apply.
- Ensure that rotary oil pumps are fitted with an oil mist filter and ensure this is checked regularly and changed when full.
- Ensure that pump exhaust gases (whether from rotary or diaphragm pumps) are vented into fume hoods/vented cupboards or other local exhaust ventilation.
- Ensure all moving parts (spindles, belts, pulleys etc. are fully guarded.
- Ballast oil pumps regularly (suggest weekly) to prevent solvent build up and subsequent degradation of the oil.
- Ensure that as much solvent as possible is trapped out using cold traps before going through the pump.
- Stand pumps on antivibration matting and if possible site them in the vented cabinets under fume hoods or in hoods to run with the doors closed.
- Do not use pump cupboards to store chemicals or other flammable materials.
- Ensure pumps are serviced regularly at least annually – contact the Mechanical Workshop, ext. 54584 for service/repair.
- Oil pumps should stand in trays to prevent spread of oil if there is a leak.
- When moving an oil pump, consider the manual handling control measures.

(5) Ovens, hotplates and heating mantles (see separate assessment for hot air guns)
- Be aware that hotplates, ovens and heating mantles may be hot (not all have a warning tag) and do not touch areas that may be hot unless appropriate heat resistant gloves are worn.
- Clean spilled chemicals up immediately.
- Do not use equipment that has spilled or dried on chemicals as these can catch fire.
- Do not rinse glassware with organic solvent and place directly in an oven – this could cause an explosion hazard.
- Chemical exposure must be controlled according to the measures identified in the COSHH assessment.
- Do not put plastics in ovens.
- Electrical hazard control measures all apply.
- In case of burns put injured part under cold running water and contact a First Aider.
- If temperature is critical, periodically check the oven thermostat with a thermometer of appropriate range.

(6) Bunsen Burners

- When lit, and not in immediate use, the Bunsen must be left with the cool and visible orange flame (air holes closed).
- Expect any apparatus heated with a Bunsen to be hot (wire gauzes, tripods etc.) and handle with tongs or thermal gloves.
- If equipment is held in the flame it should either be clamped or held with tongs, depending on size – never hand held.
- Do not use a Bunsen in the vicinity of extremely flammable, highly flammable and flammable solvents, especially if these are in open containers.
- Ensure the gas is turned off when the Bunsen is out.
- Report any smells of gas to the laboratory technicians, Estates Helpdesk (internal 52424) or the SSA (internal 57851) immediately and extinguish any other flames. If safe to do so, open windows and fume hood sashes, evacuate area closing doors behind you.

(7) Heating Baths

- If possible allow baths to cool before moving them (remove the reaction vessel instead).
- If baths are to be moved when hot, use thermal gloves.
- Empty baths of their contents before moving if possible.
- Large baths should have a stopcock at the bottom through which they can be emptied, otherwise use siphoning methods (do not start the siphon by mouth).
- If large water baths are being used which are expected to move from location to location, ensure they are mounted on a trolley with braked castors.
- Change water in a waterbath and clean vessel with suitable disinfectant before refilling with water at monthly intervals.
- Change the bath contents if they become contaminated with anything (e.g. water in an oil bath will cause spitting).
- Do not allow heating baths to 'boil' dry – keep the liquid level above the minimum but below the maximum fill lines.
- Dispose of bath contents in the proper manner (anything other than water would usually be through solvent stores as chemical waste).
- Use heating baths that can create smoke and vapours in a fume hood.
- Do not leave baths being heated to high temperature unattended, they can overheat and smoke and may catch fire.
- Reaction vessels must either be clamped or held with tongs when being heated in a bath – never hand held.
- Turn off the mixing function before adding or removing items to the bath.
- Ensure hair and loose clothing is tied back.

(8) Thermometers

Liquid in Glass

- Ensure thermometers are securely clamped in apparatus so they are unlikely to slip and break.
- Store thermometers in drawers or on shelves where they cannot fall.
- Clean them after use (when they have cooled down/warmed up).
- Do not pick them up by the bulb.
- Ensure that temperature changes are gradual, not rapid.
- Spilled mercury must be collected using the pump which is available from the Synthesis Teaching Laboratory technical staff.
- Broken glass columns must be disposed of in the glass or sharps bins.

Thermocouples

- Electrical hazard control measures apply for thermocouples.

(9) Ultrasonic Baths

- Consult the instruction manual or obtain training before using this equipment.
- Do not put any part of your body in the bath when the power is on and ultrasound waves are being generated (this could be fatal).
- Enclose the bath in an acoustic insulating container if it is to be used for long periods of time.
- Cover the bath with a lid both in and out of use.
- Wear safety glasses and gloves when using, loading and unloading the bath.
- Ensure the liquid level remains at or above the minimum level, but does not exceed the maximum level.
- Check the temperature of the bath / accuracy of the thermostat occasionally.
- Empty and clean out the bath at least on a monthly basis.
- Avoid splashing, but use a PP3 facemask if splashing cannot be avoided.
- All electrical control hazards apply.

(9) Glassware and sharps, including hypodermic needles

- Shelves where glassware is stored should be lipped to prevent glass pieces being pulled or knocked off.
- Glassware should be arranged so that selection and removal of the desired piece is easy and safe.
- Light items should be stored on higher shelves, heavier pieces lower down.
- Avoid storing tubing, rods, pipettes etc with their ends protruding from racks or over the edge of shelves.
- Do not lift heavy flasks by the neck, support them at the bottom as well.
- Keep one hand free when carrying items up and down stairs to hold on to the handrail.
- Use only glass designed specifically for that use in vacuum or pressure applications and wear goggles and use a safety screen.
- Inspect all glassware for chips, cracks and bubbles before use – any defective items must be sent for repair to the glassblower or disposed of.
- Enclose all pressure vessels in wire mesh or plastic cages, or wrap smaller vessels in adhesive tape, or use polynet.
- Do not move vessels whilst under pressure or vacuum as this increases the risk of them shattering.
- Pressure should be altered (increased or decreased) gradually.
- Vacuum desiccators should be placed on a rubber mat or smooth even surface to avoid irregular pressure on the base. They should be secured in a cage before evacuation. Slide, rather then levering the lid off.
- When freeing stubborn joints, always wrap the glassware in protective cloth or wear protective gloves.
- Assemble apparatus with the components in line and supported by clamps.
- If not clamped, support round bottomed flasks in cork rings.
- When attaching bulbs etc. to pipettes, hold the end of the pipette nearest to the bulb and gently ease the bulb over the pipette.
- Clear up broken glass immediately (research labs) or tell the technical staff (teaching and service labs) and dispose of the fragments in the glass bin.
- Dispose of sharps in the sharps containers.
- When not in use, needle tips should be sheathed.
- When washed, store needles tip down in a beaker (a stable needle store could be made by lining the inside of a beaker with blutac or plasticine and pressing needles into this, tip down, to allow them to drain safely).
- To prevent spurting of volatile liquids, cool the syringe barrel and needle before use.
- Check syringe needles or cannulae before use for cracks and pin holes as these can develop after bending or with frequent use.

- If syringes and needles have been used to transfer highly reactive reagents, ensure they are rinsed with suitable quenching agent before being either washed or disposed of.

(10) Ultraviolet lights and transilluminators

- Ensure the lamp is shielded whilst in use (use special cabinets for transilluminators and dedicated, suitably blacked out fume hoods for UV lamps).
- Switch off UV lamps when adjustments are being made to the experimental set up.
- Protect skin with long sleeves (lab coats) and gloves.
- Use tweezers for handling TLC plates within transilluminators, only switch on the lamp when the sample is in position.
- Wear eye-protection that complies with BS EN 170 to protect eyes against UV exposure (example products are Fisher Scientific – spectacles SAP-300-N, goggles SAP-495-E, faceshield SAP-600-F; Arco – spectacles 3C4000; VWR – spectacles 730-1033, goggles 730-1034, faceshield 730-1035). Check the specifications in the latest product catalogues before ordering and note this list of suppliers is not exhaustive).
- Electrical hazard control measures [C(1)] all apply.

(11) Microwave ovens

- Do not put anything metallic into the microwave.
- Operate the equipment only with the door closed (do not bypass the essential safety features of the equipment).
- Use the minimum power rating and the minimum time.
- Be aware that once the electricity is turned off, the contents of a microwave can continue heating for a few seconds, use thermal gloves or tongs to remove contents.
- Do not put tightly sealed containers in the microwave.
- Report any defects in the equipment, especially defective or loose door seals or door grids to the SSA who will arrange for microwave leak testing.
- Electrical hazard control measures [C(1)] all apply.
- Arrival of new microwave equipment into the School should be notified to the SSA, as should any equipment disposal, as a record of such equipment is kept in the School and by the University Radiological Protection Unit.

(12) X-ray diffractometers

- Work according to the Local Rules.
- Additional, specialized training is required before equipment can be operated – contact C Muryn. (ext. 51418).
- Ensure interlocks are all working and the equipment has been inspected in the last 12 months by the University Radiological Protection Service.
- Electrical hazard control measures apply.
- Control chemical exposure during sample preparation in particular as determined in the COSHH risk assessment.
- Cryogenic hazard controls may apply – the X-ray laboratory is fitted with oxygen depletion monitors.
- Display Screen Equipment control measures apply.

(13) Nuclear Magnetic Resonance (NMR), Electron Paramagnetic Resonance (EPR) Spectrometers and Mass Spectrometry

- Researchers and Technical staff using these Spectrometers should download, read, and sign the risk assessment and Procedures and Methods Sheet for working with high magnetic fields and cryogenics as they will be more involved with all aspects of the instrumentation.
- Ensure that you have been trained by the technical staff how to use the spectrometers.
- Do not enter the room containing high magnetic fields if you have a heart pacemaker or ferrous

implants.
- Keep the rope / cordon between you and the magnet.
- Keep mobile phones, keys, magnetic key fobs and magnetic swipe cards away from the magnet – preferably outside the room.
- Rooms containing NMR and EPR Spectrometers are fitted with oxygen depletion monitors, if there is an audible alarm and the red strobe light is flashing, leave the room immediately or do not enter it if outside.
- Leave the room immediately if the magnet starts to 'quench.'
- Make up samples using the fume hoods or ventilated cabinets available either in your own laboratory or in B.08 or B.14. Cap tubes before removing them from the fume hood or ventilated cabinet. Transport them round the building in double containment – not breast-pockets of lab coats.
- Use the service for samples that are classified in the COSHH system as 'V' – not the autosamplers.
- Access to the autosamplers is by block steps with a handrail – ensure the steps are stable before use and use the handrail.
- Check before loading the autosampler where it is in the cycle and only approach it if it is not moving and the magnet is not discharging a sample (A rushing sound of compressed air is heard when this occurs). Note the location of the red emergency stop button on the Varian autosamplers.
- Electrical control measures apply.
- Cryogenic hazard controls measures may apply.
- Display Screen Equipment control measures may apply in cases of extended use.
- Contact the technical staff to report problems.

(14) Optical Spectrometers and Analytical instrumentation

- Electrical control measures apply.
- Prepare samples for optical and mass spectrometry in a fume hood or laminar flow cabinet.
- Minimise the solvent vapour from HPLC and GC by working in areas supplied with local exhaust ventilation or pipe exhaust gases direct into the fume extract duct. If solvents are being collected during or after a process, ensure that the solvents bottle caps are on and have a small hole drilled in them through which the feed pipe is threaded, and also that supply solvent vessels are similarly treated.
- For chemical ionization mass spectrometry ensure the exhaust gases and pump exhausts are either ducted into local exhaust systems (fume hoods) or direct into the fume extract duct.
- Ensure you have been shown how to use the instrument or follow the instruction manual.
- Optical spectroscopy – use with sample chamber compartment closed if possible.
- Ensure that the spectrometer is not recording a spectrum when you change the sample.
- If samples are being left to run for a period of time unaccompanied, put a warning on the instrument to ensure the collection is not interrupted by another user and an overnight permit if necessary – e.g. kinetics experiments.
- Variable temperature work may be carried out – ensure appropriate gloves are worn when handling very hot or very cold samples and that warning signs are in place if the experiment is left unattended.
- If a sample is to be heated, ensure that a solvent with a high enough boiling point is used so it doesn't boil off.
- Display Screen equipment control measures may apply in cases of extended use.

(15) Compressed gases

- Download, read and abide by the procedures laid down in the Procedures and Methods sheet 005, Compressed gases on the Chemistry Intranet.
- Ensure that the cylinder is fitted with the correct regulator, which must be under 5 years old

(under 2 years for toxic and corrosive gases) and a cylinder key.
- Turn cylinder off when not in use.
- Secure the cylinder with a clamp or chain or in a stand – cylinders should never be left free-standing.
- Leak test cylinders regularly.
- When reactive gases are being used fit an anti suck-back device.
- When highly flammable gases are being used ensure a flashback arrestor is used.
- Note that the contents of the cylinder must be identified on the label – cylinder colour must not be used as the primary identifying feature.
- Transport cylinders in a cylinder trolley and ensure that the regulator has been removed and the cylinder is turned off at the cylinder head valve.
- When moving cylinders between floors, use the goods lift but do not accompany the cylinder in the lift – load it in and arrange for it to be met on the designated floor.
- Do not move cylinders when wearing open-toed sandals.
- Do not bang or drop cylinders.
- Store cylinders vertically.
- Return faulty cylinders to Stores promptly.
- Notify the SSA of the whereabouts of additional cylinders in laboratories so that the fire risk assessment can be kept updated.
- If high flow rates and high pressures are being used so that noise may be a hazard, enclose the system if possible, use appropriate PPE. If the work activity is to be regular or prolonged, contact the SSA to carry out noise measurements.
- Use minimum pressure in the regulator and the minimum flow of gas to carry out the application.

(16) Personal Protective Equipment (PPE)
- Note that other measures should be used to control hazards before the use of PPE.
- Select the correct equipment to protect from the known hazard which is also suitable for the task – e.g. there is no single glove material that will protect against all chemical hazards. Check Manufacturers charts.
- Contact lens wearers should use enclosed goggles in the laboratory.
- Use enclosed goggles when using syringes and cannulae and liquids under pressure.
- Ensure that all the equipment used for one person at the same time is compatible.
- If the equipment is available in different sizes obtain the correct size.
- If the equipment is adjustable, ensure it is fitted correctly.
- If disposable equipment is used, ensure it is disposed of correctly.
- Reusable equipment should be cleaned, inspected and returned to storage after use.
- Gloves for chemical protection should only be used when handling chemicals in a fume hood, everywhere else should be ‘clean.’
- Remove gloves (care), before touching anything, e.g. skin, fume hood sash handles, mobile phones, paperwork etc. otherwise the contamination is being spread from the gloves to these areas.

(17) High pressure reaction vessels (e.g. acid digestion bombs)
- Consult the instruction manual for the vessel being used. This will provide details of vapour pressures and loading limits for the vessels.
- To avoid dangerous overheating, check oven temperature controls regularly using a thermometer with a suitable range.
- If the reaction vessels are being heated in a water bath, ensure this does not boil dry.
- Do not exceed the maximum operating temperature for the specific vessel that you are using.
- Operator inattention or carelessness could also lead to an excessive temperature being reached.

- Unless the unit is specifically designed to be heated in a microwave, do not use a microwave oven to heat it.
- Be aware of the reagents being used – uncontrolled gaseous reactions can cause excessive pressure.
- Materials with high vapour pressure could cause over pressure of the vessel – consult the operators manual.
- Explosive materials could also cause overpressure – do not use perchloric acid or other reagents that produce a highly exothermic reaction or which might be expected to release large volumes of gas.
- Be aware that in acid systems, the solubility of certain gases will be reduced as the temperature rises which may also cause an overpressure.
- Avoid putting explosive chemical mixtures into the vessels, e.g. fats, fatty acids, glycerine etc. with nitric acid, cellulosic materials with mixed nitric and sulfuric acids.
- When using inorganic materials, always leave headspace of at least 33% of the total volume of the vessel.
- Organic materials in very small quantities may be used in this type of equipment, but do not exceed the loadings specified in the user manual for the vessel size that you are using.
- Inspect the vessels before use to ensure that they have not been deformed by undetected high internal pressures.
- Ensure each vessel has a unique identification number.
- Use no or minimal lubricant on screw threads that attaché the cap (antiseize compound may be used if the temperature is to exceed 200 degrees C).
- Do not interchange cups or other parts of the assembly if several vessels are being used in the same area.
- Inspect all parts of the apparatus for corrosion or wear – and replace if necessary.
- If the liner of the vessel needs replacing, a new cover should also be obtained.
- Use heat resistant gloves to move hot vessels.
- Do not put hot vessels straight down on the ceramic bases of fume hoods – use a thermally protective mat.
- Follow any local rules/operating procedures designed for the areas where this equipment is used.

(18) Centrifuges

- Staff to be instructed in safe handling of centrifuges and rotors.
- Inspect rotors and centrifuges for obvious damage before use. If damage is noted, do not use the equipment and contact the appropriate workshop or the manufacturer.
- Install the rotor, then place the pre-filled buckets in it.
- When changing the rotor, remove the buckets first.
- If there isn't a run down time when the centrifuge cannot be opened, do not open the lid whist the rotor is still spinning.
- When using the centrifuge, ensure that the rotation speed set does not exceed the maximum speed for the rotor.
- Chemical control measures apply when filling and emptying buckets.
- Waste must be disposed of according to School Procedures.
- Ensure all buckets are filled to an equal height and with an equal weight of material to minimize the risk of unbalancing the equipment.
- Put the lids on the buckets securely.
- Clean up any spillages.

(D) People

- Do not work on your own in a laboratory – always ensure that there is always someone who can

either see or hear you should you get into difficulties.

- Abide by any warning signage.
- Do nor deface safety signs or misuse safety equipment.
- People under the influence of alcohol or drugs are not permitted in laboratories in the School.
- Additional assessments may be needed for the young, those with physical or mental difficulties, pregnant or nursing females and reasonable adjustments will be made – contact the SSA, line manager or tutor.
- The school will endeavour to appoint only competent people through rigorous recruitment and selection procedures and will provide training as required.
- People should wear outer layers of clothing appropriate to the tasks they are carrying out – open toed sandals are not appropriate in a lab, nor are long trailing scarves (or long loose hair) etc.
- No running in the laboratory.
- Listen and abide by instructions – ask if you don't understand.

Training pre-requisites: **Additional training requirements and information is detailed in the appropriate sections** **Adequate laboratory competency**	**Level of supervision required:** **Direct Supervision** □ **Adequate Competence** x **Obtain Advice** □ **General Care** □

Level of risk remaining provided control measures are followed is generally low.

Emergency action:

Leave the area and advise the senior technician/academic staff member what the problems are.
First Aid, contact
(Basement) Terry Hayward 54584
(Ground Floor) Elaine Armstrong 57851
Simon Holden 60577
Helen Kreissl 60582
(First Floor) John Agger 54681
Delroy Flemings 54645
Keith Nixon 54718
(Second Floor) Abbas Askari 64581
Graham Booth 64581
Mike Hughes 64581
(Fifth Floor) Katie Law 54662
University Security 69966
Telephoning 9999 from any landline in the building will connect to the Emergency services.
Inform the emergency services of the location and nature of any ongoing experiments which may become unsafe if left unattended and which could not be instantly stopped prior to the Evacuation as health and safety risks would have been increased by this action.

References if any:

Signature of Assessor: **Name of Assessor (print): Dr E M Armstrong**	**Signature of Researcher/Student:** **Name of Researcher/Student (print):**

Risk rating matrix

Severity → Risk ↓	Fatal (4)	>3 days (3)	1-3 days (2)	Superficial (1)
H (3)	12	9	6	3
M (2)	8	6	4	2
L (1)	4	3	2	1

Further controls are required for any activity with residual risk rating ≥ 6

Appendix 1 :

Abbreviations

COSHH	Control of Substances Hazardous to Health Regulations
CRA	Chemical Risk Assessment
DSE	Display Screen Equipment
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
P & M Sheets	Procedures and Methods Sheets (School of Chemistry, UOM)
PPE	Personal Protective Equipment Regulations
PTFE	Polytetrafluoroethylene
SSA	School Safety Advisor
UOM	University of Manchester

Appendix 2:

Glossary of Terms

Term	Meaning
Carcinogen, carcinogenic	May, if inhaled or penetrates the skin, induce uncontrolled cell division forming a tumour which is malignant (cancerous).
Corrosive	May destroy living tissues on contact and leaves burns.
Explosive	Reacts suddenly, unpredictably and very violently releasing a lot of energy in a short period of time.
Flammable (also Extremely Flammable, Highly Flammable)	Burns easily – see P and M sheet 006, Solvents for further detail.
Harmful	If inhaled, ingested or penetrates the skin will have an adverse effect on health.
Irritant	A non-corrosive substance which through immediate, prolonged or repeated contact with the skin or mucous membranes can cause inflammation.
Lachrymator, lachrymatory	A substance which promotes tear formation.
Mutagen, mutagenic	May cause inheritable genetic defects.
Narcotic	May induce drowsiness, sleep or stupor or altered mental state through its chemical properties.
Oxidizing	Chemical that reacts, or facilitates reaction with oxygen by losing electrons or facilitating loss of electrons.
Peroxidisable	Forms explosive peroxides.
Pyrophoric	Substance that spontaneously bursts into flames when exposed to air.
Sensitizer	May cause an allergic reaction if inhaled or in contact with the skin which will progressively worsen on further exposures.
Teratogen, teratogenic	Substance that interrupts or alters the normal development of an unborn child.
Toxic (also Extremely toxic, Highly Toxic)	If inhaled, ingested or penetrates the skin may involve extremely serious acute or chronic health risks and even death.