

Chemnitz, the Technical University



Faculty of Sciences
Institute of Chemistry
Department of Inorganic Chemistry

Prof. Dr. Heinrich Lang

SAFETY HANDBOOK

The Safety Handbook has been read and the information understood.

NAME (Print)

SIGNATURE

SUPERVISOR SIGNATURE

DATE

EMERGENCY

Emergency Number

Fire, Ambulance	(0)112 or (*)112
Emergency doctor	(0)19292
Police	(0)110 or (*)110
Average	4444

Fire

If you discover fire:

- Shout a warning
- Operate an alarm
- Ring (0)112 – Give location and building name
- Use a hose or extinguisher (only if the fire is minor)

Gas Leak

If there is a major gas leak

- Warn others but do not operate the fire alarm or electrical equipment
- Telephone the Fire service – Dial (0)112
- Evacuate the building and go to the assembly area

When Alarms ring

- Leave the building immediately for the assembly area
- Use stairs NOT lifts
- Don't run, jostle, push
- Don't re-enter the building until authorised to do so

Assembly Area

Area towards the train station or court of the University

Amendments

Chemistry Department Key Contacts

Emergency Telephone Numbers

Fire, Ambulance	(0)112	Emergency doctor	(0)19292
Police	(0)110		
Average	4444	Works and Services	4442 or 4443
University Safety Officer (Institute of Chemistry: Dr. M. Müller)			1456

Staff holding First Aid Certificates

	Room	Extension		Room	Extension
AC – Regina Gutsche	161	1544	AC – Ute Stöß	153a	1330
OC – Jana Buschmann	174	1245	OC – Marion Lindner	176	1419
OC – Evelyn Scheppeler	173a	1462	PC – Gabriele Goldmann	151a	1383
PC – Elke Rahm	245	1867	PC – Dr. Gerd Treffer	233	1508
TC – Renate Benndorf	241	1250	TC – Maria Berger	236	1517
TC – Uwe Schauer	241	1250	PolC – Jeanette Dörr	317a	1336
PolC – Simone Kehr	315	1335	PolC – Dr. Hardy Müller	315	1335

Hospitals

Klinikum Chemnitz, Flemmingstraße 2	(0371)-333-0
DRK Krankenhaus Chemnitz-Rabenstein, Unritzstr. 23	(0371)-832-0
Zeisigwaldkliniken Bethanien, Zeisigwaldstr. 101	(0371)-430-0

Doctors

Prof. Dr. P. Daniel, CHA, Klinikum Chemnitz, Flemmingstr. 2	(0371)-333-33220
Dr. V. Olbrich, FA Chirurgie, Klinikum Chemnitz, Flemmingstr. 2	(0371)-333-33522
Dr. M. Kupfer, FA Chirurgie, 09113 Chemnitz, Leipziger Str. 53-59	(0371)-37388-0
Dr. A. Meichsner, FA Chirurgie, 09113 Chemnitz, Leipziger Str. 53-59	(0371)-37388-0
Frau Dr. Ch. Sell, FÄ Ki-Chirurgie, 09130 Chemnitz, Hainstr. 112-114	(0371)-4016277
DM D. Tränkmann, FA Chirurgie, 09130 Chemnitz, Hainstr. 112-114	(0371)-4016277
Dr. B. Flade, FA Chirurgie, 09130 Chemnitz, Zeisigwaldstr. 105	(0371)-4012247
Dr. P. Hasek, FA Chirurgie, 09119 Chemnitz, Goethestr. 5-7	(0371)-3837210
Dr. L. Kubisch, FA Chirurgie, 09112 Chemnitz, Uhlichstr. 13	(0371)-301514
Dr. V. Kühnert, FA Chirurgie, 09126 Chemnitz, Clausstr. 76-80	(0371)-510305
Dr. F. Lohse, CHA, Klinik Unfchir, Krankenhaus Küchwald, Bürgerstr. 2	(0371)-333-42582
Dr. K. Nehler, FA Chirurgie, 09116 Chemnitz, Göbelstr. 5	(0371)-852188
Dr. H. Ost, FA Chirurgie, 09113 Chemnitz, Str. der Nationen 148	(0371)-411393
Dr. V. Reitenbach, FA Chirurgie, 09120 Chemnitz, Paul-Bertz-Str. 20	(0371)-304626
Dr. M. Schönenfeldt, FÄ Ki-Chirurgie, 09119 Chemnitz, Am Walkgraben 31	(0371)-364642

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A. Inorganic Departmental Safety Rules

1. **Students and staff must wear safety glasses and laboratory coats in laboratories and workshops** except for those areas, which have been officially exempted from this requirement.
2. **Proper footwear must be worn in all laboratories and workshops.** The whole foot must be protected.
3. **Smoking is prohibited.**
4. **Eating and drinking in laboratories is prohibited.**
5. **Work with hazardous or toxic materials must not be undertaken without proper precautions.** If any doubt exists consult your supervisor or the Safety Officer (Dr. Hardy Müller, Room 315, Ext. 1335).
6. **All accidents must be reported to Dr. Hardy Müller and to the secretary of the Department of Inorganic Chemistry (Mrs. Jutta Ruder, Room 1/157, Ext. 1200) immediately.** This is particularly important when the circumstances leading to the accident are likely to recur. Acquaint yourself with the first aid equipment provided.
7. **It is illegal for staff or students to work in an office, laboratory, or workshop with the major access door locked.** (An open hatch is unacceptable as an access in the event of an emergency.)
8. **Undergraduate students are not permitted to work in class laboratories outside the prescribed hours.**
9. **Students and staff are not allowed to carry out experimental work in a laboratory unless a second person is within call. No student is to work in a laboratory after 11 p.m. without written permission from a supervisor.**
10. **Undergraduates are not allowed to leave an experiment running overnight without obtaining permission from a supervisor.** Graduate students who find it necessary to run such experiments are expected to take all reasonable precautions, and should always consult their supervisor. A "Temporary Operating Permit" card is to be displayed beside the equipment and at the doorway to the laboratory.
11. **Students are not permitted to carry out electrical wiring on equipment or extension cords.**
12. **All Flammable Materials unless in use must be stored in the storage cabinets in order to comply with the Dangerous Goods Act.**

B. General Information

1. *Operation of Chemistry Department Store (Liquid N₂)*

- a) **Chemicals and Equipment** which the department has in stock may be obtained from the Issue Store on the ground level. Requisitions for expensive chemicals require a supervisor's signature. **The person who gets the chemicals has the responsibility for safe storage and disposal** (also see Section J).
- b) **Liquid Nitrogen** is normally available from the Reichenhainer Straße. Therefore the empty 70 L – 100 L storage dewars must be placed in the court of TU Chemnitz. On the next day the filled dewars must be picked up. It is forbidden to let filled N₂-dewars overnight in the court. They must be in lab stored. If changing dewars yourself wear safety glasses and do **not** leave empty dewars or a shortage of liquid nitrogen will result.

2. *LPG (Liquefied Petroleum Gas)*

LPG is reticulated through pipes in the building for use in LPG burners. It should be noted that LPG itself is odourless and because of this an odorant (ethyl mercaptan) is added in trace amounts so that gas leaks will be noticed. (Familiarise yourself with this odour). LPG is heavier than air and could therefore accumulate on floors, sinks, drains, etc. in explosive mixtures with air. Whenever LPG is not in use or when the laboratory is vacated, all isolation valves must be switched **off**.

3. *Equipment Maintenance*

All electrical equipment must be kept in a clean usable condition and **not left in fume cupboards**.

Regular inspection of electrical equipment is required by law. If you find any equipment to be faulty or if the reinspection date has passed, immediately unplug and label the equipment as faulty or out of date and notify ? (Room ?, Ext. ?).

Equipment such as magnetic stirrers - hot plates, heating mantles, balances, ovens, vacuum pumps requiring servicing should be reported to Mrs. Ute Stöß, Room 1/153a, Ext. 1330.

4. *Glassblowing*

Requests for glassblowing assistance should be made to Mr. Thurm, Room 1/ and should be accompanied by a requisition, and by a diagram of the desired glassware, complete with all necessary measurements. Glassware given to Mr. Thurm for repair or modification **must** be clean, dry and **free of inflammable vapours**. Major glassblowing projects must be requested with a supervisor's approval. Work on sealed ampoules requires the authorisation of an academic staff member.

5. *Breakdowns in Services*

Breakdowns in general services should be reported to Prof. Dr. H. Lang (Room 1/158, Ext. 1200) or Mrs. Jutta Ruder (Room 1/157, Ext. 1200). In the absence of these people any serious breakdown should be reported at once to a staff member or to the the "Leitwarte", Ext..

In cases where a potential hazard is involved (e.g., leaking gas taps) contact Works and Services (Ext. "Leitwarte") or Security after hours (Ext. Pforte in an emergency).

6. *Microanalyses*

Students who wish to have compounds analysed should first consult their supervisor about requirements of purity and the best method of packaging particular samples. The cost of analysis for CHN is €4,00; make sure that only essential information is requested. Packaged samples (to sent to the University of Heidelberg) should be given to Mrs. Ruder (Room 1/157), together with a requisition bearing a supervisor's signature. As a matter of course, samples should first be examined under a microscope to detect any gross impurities. Please, notice: In Chemnitz only elemental analysis available for compounds, which do not contain fluoide! If your sample features fluoide, you must send it to Heidelberg. The address will be given you by Mrs. Ruder (Room 1/157).

7. *Use of special equipment*

Students who need to use inorganic departmental equipment, such as IR, UV-VIS, NMR, TGA, DSC, electrochemistry, osmometry, HPCL or chromatographs, should first contact their supervisor for the necessary procedure and referral to the staff member responsible for the instrument. **In no case should a student begin to use an instrument without a clear understanding of the operating procedure, and the approval of the equipment's supervisor.**

8. *Health and Safety Information*

Two ring binders containing the latest Occupational Safety and Health publications are located in the Library.



9. *Other services and facilities*

An **ice-making machine** and salt bucket is located in cellar, Room (Mr. Grobe).

Photocopying can be carried out using the photo copiers in Room 1/157 (Mrs. Ruder).

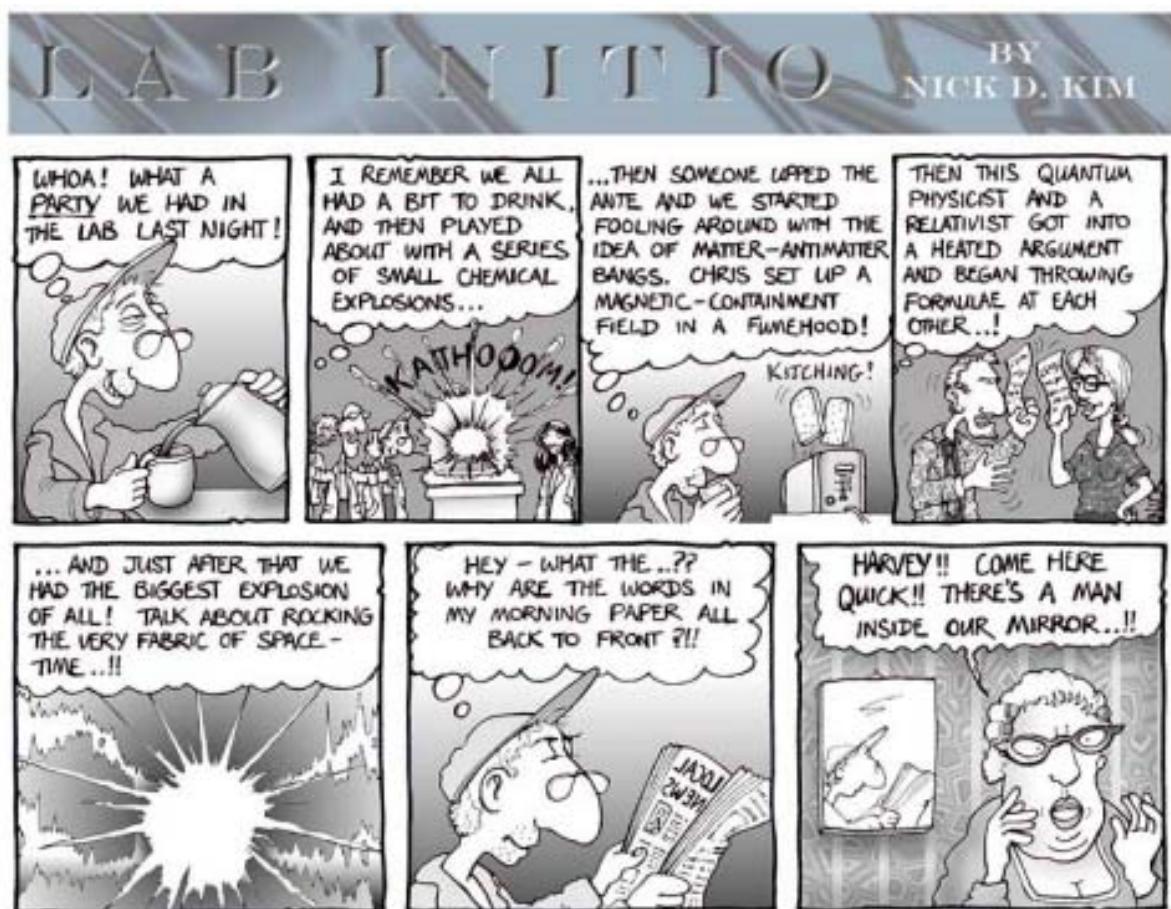
10. *Leaving apparatus on overnight*

- a) Experiments which need to run overnight require the approval of a staff member and should be carried out in the special marked hood. This hood must be left clean and tidy after use and experiments left running must be labelled with the operator's name and details of the materials in use.
- b) When an experiment needs to be left running overnight in research labs a "**Temporary Operating Permit**" card must be displayed either beside the equipment or on fumehood sash and at the doorway to the laboratory. These cards, must be signed by an academic staff member and approved for each experiment.
- c) Equipment which is to be kept running on a permanent or semi permanent basis must display a Long Term Permanent Operating Equipment card outside the room.
- d) Electrical equipment like ovens, water baths, stirrers, not required for immediate use should be switched off.

11. *Procedure when research work has been completed*

Once bench work has been completed students in consultation with their supervisor must:

- Clean up their laboratory work bench including all fumecupboards used
- Return chemicals and glassware to the store
- Return any keys issued to them



C. Emergency Procedures

1. *Fire*

Fire is one of the greatest potential hazards in the building and every effort should be made to avoid the possibility of starting a fire. Examples of hazards include: bunsen burners left on; water baths running dry; self igniting chemical mixture; electrical equipment in poor maintenance; and lack of precautions when handling flammable solvents.

The building is protected by an Automatic Fire Alarm System. If an outbreak of fire was serious it would activate the fire horns and automatically notify the Fire Brigade.

a) *Fire Emergency*

If you discover a fire, immediately leave the area and go to the nearest fire alarm box, break the glass and activate the alarm to evacuate the building. Call the Fire Brigade by phoning 112. Only revisit the fire if it is safe to do so and two or more people are present.

If you are present when a fire breaks out you may attempt to put the fire out at the same time calling "fire" to alert other people in the area who should carry out the steps appropriate to the discovery of a fire.

Prompt action will often prevent a small fire from becoming a major disaster by smothering the flames with a wet towel or even a notebook, and the use of the correct type of portable fire extinguisher.

b) *Fire Extinguishers*

The following types of fire extinguishers are installed throughout the buildings.

Type and Location	Colour	To Use	For Use Against
Dry Powder; middle of corridor	Red with white band	Remove pin or break seal, squeeze handle	General purpose, especially solvent fires
CO ₂ Gas; throughout building	Red with black band	Remove pin or break seal, squeeze handle	General purpose, especially electrical fires
Hose Reels		Turn on stop valve, turn nozzle and control water flow	Paper, rubbish, wood

FAMILIARIZE YOURSELF WITH THE LOCATION OF EACH TYPE OF EXTINGUISHER AND THE REELS ON YOUR FLOOR.

- i) *Used extinguishers.* When an extinguisher has been used, immediately notify Bruce Whitfield or Laurie Anderson who will arrange to have it recharged. A used extinguisher should be given to Mrs. Stöß (Room 1/153a).
- ii) *Blankets* are provided in corridors and labs. They could be used for smothering the flames when a person's clothing is alight. Do not roll a person in a blanket if clothes are alight as the blanket could act as a chimney and divert the heat and smoke towards the face.

2. *Chemical Hazards*

a) If you have a major spillage, a cylinder or apparatus leaking a hazardous gas or a reaction that has become potentially explosive or any such sudden emergency immediately contact one of the following persons for **advice** on what to do.

Dr. Hardy Müller (Room 1/315, Ext. 1335)
 Prof. Dr. H. Lang (Room 1/158, Ext. 1200)
 Prof. Dr. W. Thiel (Room 1/162, Ext. 1517)

b) All preparations and chemical operations which constitute a significant hazard must be carried out very carefully.

c) Emergency life support units are available on all floors. These Emergency life support units have a 12 minute air supply to wear for emergency entry into smoke or gas filled rooms.

d) Combined Emergency eye washes and handheld showers are located in every lab.

3. *Accidents*

All accident injuries must be reported promptly to Dr. Hardy Müller (Room 1/315, Ext. 1335). Also a University "Accident or Serious Harm Report" form which is available from Mrs. Ruder (Room 1/157) must be completed as soon as possible and returned to her.

4. *First Aid Assistance*

The Department has a number of First-Aiders who are available for assistance in an injury. A Medical Practitioner is available at Student Health Service. For details see the **EMERGENCY** and **SAFETY INFORMATION** notices which are displayed throughout the building.

The following persons have current first aid certificates.

	Room	Extension		Room	Extension
AC – Regina Gutsche	161	1544	AC – Ute Stöß	153a	1330
OC – Jana Buschmann	174	1245	OC – Marion Lindner	176	1419
OC – Evelyn Scheppeler	173a	1462	PC – Gabriele Goldmann	151a	1383
PC – Elke Rahm	245	1867	PC – Dr. Gerd Treffer	233	1508
TC – Renate Benndorf	241	1250	TC – Maria Berger	236	1517
TC – Uwe Schauer	241	1250	PolC – Jeanette Dörr	317a	1336
PolC – Simone Kehr	315	1335	PolC – Dr. Hardy Müller	315	1335

In the case of **serious** injury or illness telephone 112 and request an ambulance.

First aid facilities in the Chemistry Building are

First Aid Boxes. First Aid Boxes are located on each floor. These are clearly identified by a standard First Aid sign. The stock levels of First Aid requisites as determined by Mrs. Gutsche (Room 1/161) must be maintained.



D. Evacuation Procedures

When you hear the fire alarm you must leave the building immediately using either the stairs of the building. Assemble on the area towards the train station or court of the University. Do not gather too close to the building.

DO NOT USE LIFTS. They may fail in an emergency.

If a person is unable to leave the building by stairs, leave them with someone either near the main lifts and contact the building warden or fire brigade immediately on reaching the University court.

1. *Fire Alarm*

- Turn off all bunsen burners.
- Turn off all electrical equipment which cannot be left unattended.
- Close the windows.
- Turn off LPG valve.
- Leave the laboratory/room and close the door.
- Make sure **all** the corridor and laboratory smoke doors are closed to prevent draughts.
- Leave the building under the direction of the floor warden, using the stairs in the link block or south end of the building.
- If for some reason a warden is missing, any member of staff should be prepared to take over.

2. *Responsibilities of Emergency*

- Instruct all personnel to leave the building.
- Close the corridor and laboratory smoke doors.
- Check that all LPG valves are off.
- Ensure as far as possible that your floor is clear.
- Wait just outside the area towards the train station or the court of the University.

3. *Undergraduate Laboratories*

Staff in charge of undergraduate laboratories should get students to stop their work, turn off burners, turn off electrical gear and shut windows and doors.

In the event of the fire preventing you leaving by the designated exit, be sensible and use the exit at the other end.

E. Access to the Building

1. *Normal Working Days*

The doors of the building and the main-entries are open from 6.00 am to 10.00 pm Monday to Friday on normal working days. On Saturday from 7.00 am to 2.00 pm.

2. *Night Time, Weekends, University or Public Holidays*

The doors of the building (main-entries) are secured throughout all holidays, and every night during which time the only entry and **normal** exit is via the front door (doorkeeper, "Pforte").

3. *Working Outside Normal Hours*

Any inherently hazardous operations must never be carried out alone. Potentially hazardous work should only proceed when informed people are in the vicinity; nights and holidays should be avoided, but if this is not possible, at least one other person should be within easy call, and know that the operation is being performed.

All equipment not in use must be turned off at the power outlet during the night, weekend etc. Equipment which must operate unattended at such times must have a "Temporary Operating Permit" card displayed outside the laboratory or room where the equipment is left operating. Permits must be signed by a supervisor.

4. *Visitors and New Staff*

All new staff, Ph.D., M.Sc., B.Sc., Diplomanden, research assistants and visitors **must** report to the Secretaries' Office (Room 1/157 Mrs. Ruder) on their arrival in the building where they will be required to provide the following information.

- Departmental staff member contact
- Work location in the building
- The type of work they will be carrying out: laboratory, office, instrumental, computer
- Any first aid training or other specialised skills
- Any disabilities which may affect their exit from the building in an emergency

The following will be provided:

- Authorisation forms and photocopying cards if required
- If laboratory bench work is to be carried out the person must sign for a copy of the Inorganic Departmental Safety Handbook which must be read and signed before commencing work

Chemistry Staff who fail to register their students, research assistant or visitor with the Secretaries must bear the responsibility and liability for any accident, hazard, instrumental and computer problems which may occur.

Adult visitors to laboratories and workshops must be safe-guarded as appropriate, e.g. with eye protection in a designated eye protection area. The responsibility rests with the host.

Contractors must liaise with N.N. before commencing work within the Department of Inorganic Chemistry.

The practice of staff members bringing in young children into the Department, especially in the evening or at weekends, is potentially dangerous and undesirable. Laboratories, workshops and the library are strictly out-of-bounds to children.

F. Hazard Identification and Personal Protection

1. *Potentially Hazardous Situation*

All staff and research students are encouraged to report to a member of the Safety Committee, any perceived or suspected hazardous situation or practice, including a "Near Miss"! A Hazard Form should also be completed and returned to N.N.

2. *Hazard Identification*

Supervisors and Graduate students will be asked to complete and sign Hazard Identification and Assessment forms. Please give this full attention and have returns to N.N.

3. *Dress*

The Inorganic Department's safety rules ("Institute Rules) on dress must be observed. Briefly summarised as follows: Each worker in a Laboratory, Store or Workshop must wear adequate town or walking shoes, a laboratory coat of at least knee length or overalls as appropriate, suitable eye protection and specially provided protective gloves, footwear and specialised clothing when necessary. Long hair must be properly confined to avoid entanglements.

4. *Eye Protection*

In any laboratory containing glassware and/or chemicals there is an ever present risk of *serious eye injury*. It is a sad fact that in the past many scientists have been **blinded** in some way in laboratory accidents. This risk can easily be minimised by **wearing appropriate eye protection in all laboratories at all times**. Since you are at risk of serious injury due to events in any part of the laboratory you **must not** take off your safety glasses in the laboratory even if you are not manipulating chemicals and/or glassware. Supervisory staff should be particularly vigilant in bringing such risks to the attention of other staff, and ensuring that appropriate protection is provided and used.

Simple safety glasses with shatterproof lenses and protective side panels are adequate for most laboratory situations. Students who wear **contact lenses** are however subject to an additional hazard. In the event of chemicals entering the eye it is often difficult to remove contact lenses in order to allow thorough washing of the eye. This makes it essential that further safety measures are undertaken. Contact lens wearers should either arrange to wear prescription safety glasses in the laboratory and thereby avoid the problem or they should wear full protective goggles whilst in the laboratory.

Where ultraviolet light is being used (e.g. in photography, lasers or UV spectrophotometers etc.) appropriate protective glasses must be worn.

All laser light sources must be regarded as potentially dangerous. Never look directly into a laser beam, or a beam reflected from another surface. Laboratories housing analytical equipment fitting with a laser light source should display the standard "Caution/Danger Laser Beam" sign on the door. Any procedure which requires that a laser beam be exposed must be performed by a suitably protected and qualified person, during which time a "NO ENTRY" sign must be displayed on the door.

5. *Laboratory Coats*

- a) Laboratory coats must be worn by all students and employees (academic staff, laboratory staff and demonstrators) in undergraduate laboratories.
- b) The wearing of laboratory coats in research laboratories will be at the discretion of the research group supervisor. However, if laboratory coats are considered unnecessary, the supervisor must submit the reasons in writing to the Department Safety Officer, Dr. Müller, for approval.
- c) The Chemistry Store is to be treated as a laboratory where laboratory coats and safety glasses must be worn by all employees and students collecting chemicals.
- d) Laboratory coats or other protective work clothing worn in contaminated areas shall not be worn in Tea Rooms, Tutorial Rooms or Lecture Theatres etc.

6. *Gloves, Facemasks and Shields, Safety Shoes etc.*

When there is the possibility of injury or infection from mechanical or chemical sources, adequate protection must be observed by wearing or using appropriate protective clothing or devices. It is recommended that safety shields be used whenever a potentially hazardous or explosive operation is being carried out at a bench.

7. *Food and Drink in Laboratories*

Eating lunches and brewing tea or coffee in laboratories is unacceptable for obvious safety reasons. In particular, never drink from a beaker or flask: this practice has led elsewhere to fatal accidents. Foodstuffs must not be stored in laboratory refrigerators or warmed in laboratory ovens. The only place food may be heated is in the cooking equipment in the seminar room.

8. *Smoking*

Smoking is prohibited in the whole building.

9. *Running in the Building*

Except in an emergency, do not run within the building. A collision with another person carrying something could be very serious, and slipping on floors and stairs is a common cause of injury.

10. *Unsafe Condition Report*

When anyone in the Department of Inorganic Chemistry (Institute of Chemistry) considers that there is a deficiency in current safety procedures, or that improvements could be made in certain areas, there are a number of communication avenues open to the person. The matter can be reported to a member of the Safety Committee. The

Safety Committee member will then, after broader consultation, decide whether there is a case for taking the matter to the Chair of the Safety Committee. If the matter concerns a change in Department policy, the Chair will convene a meeting of the Safety Committee to discuss the issue.

G. Harassment

Harassment can happen to anyone: students, staff, women or men. It can also come from anyone. Harassment usually involves abuse of power, and is serious and distressing for the recipient of harassment. In the Chemistry Department, complaints of harassment can be directed to the following appointed persons in a confidential manner.

	Room	Extension
Mrs. Dr. Dietrich		

Remember: if you are being harassed, it is not your fault. You have the responsibility to yourself and to other potential victims to do something about harassment immediately.

H. Safety in the Use of Equipment

1. Glassware

Glass apparatus which is cracked or has jagged edges must be repaired or disposed of immediately. The most common cause of major or minor cuts to the hands are

- a) Handling damaged glassware
- b) Pushing glass tubing through a hole in the rubber stopper
- c) Fitting flexible tubing to a glass tube or outlet

The possibility of injury arising from (b) and (c) can be reduced by using tubing of the correct size together with a small amount of lubricant (glycerol and ethanol, or preferably water). Also, keep hands close together when carrying out operations (b) and (c) described above. This reduces leverage on the glass which causes breakage.

- a) Pipettes.** Never use mouth suction pipetting for any substances or solution which could be injurious if it entered the mouth, eg strong acids, alkalis and solvents. There are several excellent mechanical-suction devices for pipettes which are readily available.
- b) Glassware under Vacuum.** All glassware subject to vacuum conditions must be of the correct design and manufacture, it should be periodically checked for strain and damage, and all such glassware drawn "new" from store should be similarly checked before use. Strain checks and annealing, if required, can be carried out by Glassblowing Workshop. Scratched glassware should **never** be used for vacuum work nor thin walled glassware with flat sections such as standard conical flasks. Heavy walled buchner flasks are o.k.
- c) All flasks** containing gases **must** have a disc wired onto the flask identifying their contents.
- d) Dirty Glassware.** All dirty glassware should be rinsed free of harmful chemicals before being set aside for washing up.

e) **Acid Cleaning.** All containers for cleaning pipettes etc. should be of polythene (with or without a glass liner) and should be secured to a wall by an easily removable polythene strap.

These and other containers of "acid" should also stand in a vessel or tray large enough to contain the whole volume should the container develop a leak.

**Eye Protection and Laboratory Coat Must Be Worn
When Handling "Cleaning" Acids or Alkalis**

f) **Research Work Involving Sealed Ampoules.** Experiments involving sealed glass apparatus are *intrinsically dangerous*. Pressure changes within the vessel create the possibility of *explosion (or implosion)* with attendant risks of **major injury from broken glass**. The risks of explosion are higher for volatile and reactive materials. In recognition of these risks the following procedures **must** be followed.

- i) Experiments involving sealed ampoules should only be undertaken with the express approval of a supervisor or nominated deputy who should ensure that a complete hazard assessment has been undertaken. Their consent to the experiment **must** be indicated by a signature on the bottom of the form.
- ii) Ampoules should be sealed by the glassblowers who should be given complete information about the contents of the ampoule relevant to safety. You must complete the section at the bottom of the form concerning the contents of the ampoule to be sealed.
- iii) Appropriate safety equipment (safety shields etc.) should be used for all experiments and manipulations involving sealed ampoules.
- iv) Due care should be taken in the opening of sealed ampoules. If in doubt you should carry out this operation in association with the glassblowers. It is **essential** that you assess the likely pressure within the ampoule and take steps (such as cooling in the event of possible high internal pressure) to minimise the risks associated with the opening process.

g) **Disposal of Glassware.** Broken and/or disposal glassware should be rinsed (see 5.1.3) and placed for disposal in special "Glass Only" waste bins marked as such.

2. Electrical Equipment

- a) Before using any electrical equipment make sure it has an electrical sticker indicating it has been electrically checked and the date recorded. If the equipment has no sticker do not use it until it has been checked (see above). Equipment must be clean before it is checked.
- b) Should any electrical equipment suffer any damage (water, chemical spill) arrange for it to be electrically checked immediately before use.
- c) Repair or modification to all equipment capable of being connected to the building electrical supply shall be carried out **only** by authorised electronic or mechanical workshop staff.

- d) All new and externally borrowed mains operated equipment must be inspected and approved, before that equipment may be used.
- e) Electrical leads should be removed from the power outlet by pulling on the plug, and not on the cable.
- f) Electrical cables should be kept off floors to minimise hazards and to assist the cleaners. If this is unavoidable then a ramped cover must be installed over the cables to facilitate the movement of equipment and to minimise accidents.
- g) All work involving the electrical supply for the building, i.e. fittings, fixed wiring, switchboards, etc., shall be carried out by Works and Services staff.
- h) **Circuit Breakers.** When a circuit breaker has "tripped" on overload, the circuit and its load must be checked by an authorised person before power is restored.
- i) **Multi Outlet Power Boards** should be fixed to a vertical surface and not left lying "socket up" on a bench top, or on the floor.
- j) **Double Adapters.** Not more than one double adapter may be used per power outlet.
- k) **Electric Heaters.** "Open bar" radiators and fan heaters in Laboratories and Stores are unacceptable fire and explosion hazards and must not be used. Hair dryers and heat guns are equally hazardous in the presence of flammable solvents and should be used with extreme care. Modern hot plates and hot plate/stirrers are usually suitable for work with flammable solvents. Care must be taken not to use those of older designs which could have open heaters under the top plate.
- l) **Refrigerators.** All laboratory refrigerators have been modified by having all internal potential sources of sparks eliminated, making them safe for the storage of flammables. This modification includes the mounting of the thermostat on the outside of the cabinet and the removal of the internal light and switch.
- m) **Rotary Evaporators.** When low boiling point solvents are being used in rotary evaporators, it is good practice to cool the receiver in order to avoid a considerable flow of the solvent into the water pump (and hence to the drains).

3. *Water cooled systems*

- a) Tapered plastic adapters must **not** be used in water cooling lines.
- b) Connections to metal pipework should be made either with copper tubing *via* the appropriate fittings or with the yellow tubing available from the Store and secured with the metal band clamps available from the Mechanical Workshop. Tubing attached to a tap must be securely clamped. The drain line must be firmly held in position. **Note:** At night the water pressure increases considerably. For preference a piece of copper tube should be used or the end at the drain line be weighted or tied down.
- c) Rubber tubing in good condition can be used for glass condensers, however, if these are to be left unattended for long periods the tubing must be secured to the tap and the condenser with tube clamps.

- d) The water pressure to the building can vary overnight and sudden changes in pressure can part poor connections.
- e) If cooling water is not required overnight then turn it off before you leave.

4. *Fume Cupboards*

Fume cupboards should not be used for storage of chemicals. The total amount of flammable liquids in use and solvent residues in fume cupboards **must not exceed 2.5 litres**. If fume cupboards are found in an untidy and hazardous state and used to store chemicals the laboratory in which it is situated will be closed down until the accepted standards are met.

The sash on the fume cupboards must be pulled down below the indicated mark at all times, except when setting up equipment. This allows an adequate air flow through the cupboard.

Any queries as to the suitability of a fume cupboard for a specific operation must be directed to the Safety Officer, Dr. Müller.

Fume cupboards **must** be completely cleaned out every 6 months and inspected by N.N. Performance of cupboards are tested every year.

Fume cupboards should be kept clean and clear of all **unnecessary** bottles and apparatus, and the practice of storing materials in a fume cupboard is prohibited.

5. *Gas Cylinders*

- a) All gas cylinders must be securely chained or strapped in an upright position to a bench or wall etc.
- b) Proper trolleys must be used for transport of cylinders.
- c) Unconnected gas cylinders must not be stored inside the building.
- d) Do not store or use compressed gases in unventilated areas.
- e) Avoid mechanical damage to cylinders of their control valves: **their destructive potential is unbelievable**.
- f) Do not use undue force in opening or closing a valve. Never use oil or grease!
- g) Special precautions are needed when using compressed (or liquefied) toxic gases such as chlorine, ammonia etc. The Departmental Safety Officer, Dr. Müller, can be consulted before such cylinders are used in the Department.
- h) There are at least 20 different connections between gas cylinders and their regulators. These include right and left hand threads, varying thread diameters and thread pitches. If in doubt consult with the mechanical workshop for their assistance.

6. *Rotary Vacuum Pumps - Operation and Basic Maintenance*

As with all machinery there are basic checks to be made prior to the safe operation of rotary vacuum pumps.

a) Precheck - Pumping units should be in a clean and tidy state, both in use and storage.

- (i) Check oil level by looking at the sight glass.
- (ii) The pump should be free of any external oil leakage.
- (iii) Check condition of electrical cable and plug.
- (iv) Check condition of pump for cracks, etc.
- (v) Liquid nitrogen cold "fingers" **must** be empty, clean and dry prior to switching the pump on.
- (vi) The bulb on top of the pump inlet must be empty of pump oil. If this bulb contains oil it means the previous user has switched the pump off without venting the system to atmosphere.

If in doubt contact the Mechanical Workshop before proceeding with the use of the pump.

b) Turning pump on - the following steps must be carried out in the order listed.

- (i) **Replace cold finger.**
- (ii) Isolate your glassware from the pump system.
- (iii) Close the venting valve on the pump system.
- (iv) Ensure pump exhaust is piped to a fumehood.
- (v) Plug in and turn on.
- (vi) Place full liquid nitrogen dewar around cold finger.
- (vii) Allow approx. 5 mins then open isolation valve to your glassware.

c) Turning pump off - the following steps must be carried out in the order listed.

- (i) At the completion of your process with pump still running vent the complete system to atmosphere.
- (ii) Then immediately turn off the pump.
- (iii) Remove Liquid nitrogen dewar from cold finger.
- (iv) **Allow time for cold finger to completely thaw.**
- (v) Remove the cold finger and correctly dispose of the contents.
- (vi) Clean and dry the cold finger ready for the next user.

I. Safety in the Use of Laboratory Space

1. General Laboratories

Good housekeeping should always be maintained; it is an essential part of basic Laboratory Practice and Laboratory Safety.

- Dispose of unwanted materials immediately
- Clean up all spills right away
- Maintain adequate working space
- Keep floors and exits clear of apparatus and materials

2. Monthly Safety Inspections

At the end of each month, a group of Safety Committee representatives will inspect the laboratories. The inspection reports are circulated by the Safety Officer to group leaders, who are then responsible for the implementation of the findings.

3. Annual Clean-Up

A thorough clean-up of all laboratories and instrument rooms in the Department is arranged towards the end of each year. Each group is required to cease work for at least one full day in order to carry out the clean-up. An inspection by the Safety Officer and group leaders is required to ensure that the following points receive close attention:

- All shelves, cupboards, drawers, and fume-hoods must be thoroughly cleaned;
- Each bottle of reagent must be examined and a decision made as to whether it is to be kept, relocated, combined, rebottled, returned to store, or disposed of;
- Refrigerators must be cleaned out and defrosted;
- Arrangements must be made for the recovery or disposal of residues;
- Surplus glassware must be returned to the store and broken items submitted to the glassblowers for repair;
- Electrical and other general items of laboratory equipment must be cleaned, examined for faults, and be repaired by the Workshop if necessary;
- Faulty switches, power points, light fittings, etc., as well as any other laboratory fittings in need of maintenance, must be isolated from the mains, labelled as such and reported to the workshop immediately.

An inspection by the Head of Department and representatives of the Safety Committee of all laboratories follows the clean-up.

J. Safety in the Use of Chemicals

1. Use and Transport of Chemicals

- a) Many chemicals cause poisoning if they are breathed, ingested, or come into contact with the skin. Some chemicals, if improperly handled, cause fire or explosion. Memorise the emergency safety routines and know where to find fire fighting equipment and the nearest large sink and eyewash stations. Above all,

familiarise yourself with the hazards of, and the control procedures for, the chemicals that you use.

- b)** All containers must be **clearly** labelled with the **current** contents. Containers should never carry more than one contents label and unlabelled containers should be taken to the Issue Store for disposal. Unlabelled containers are the responsibility of the supervisor of the laboratory in which they are found.
- c)** Before obtaining a new hazardous chemical or instituting a new hazardous procedure it is essential to check with your supervisor or the Safety Officer. **It is the responsibility of persons using dangerous materials to warn relevant personnel of the potential hazard.** When a new unusually hazardous chemical is brought into the laboratory an "**Unusually Hazardous Substance Form**" must be completed and a suitable hazard control procedure devised. The relevant Material Data Sheets must be studied and posted in close proximity to your workspace for ready consultation.
- d)** Problems have arisen in the Department because stocks of hazardous chemicals which are no longer needed tend to build up over the years. To prevent this, order the minimum needed for the work in hand. For example if you need 10mL of a solvent, get it from a colleague rather than obtaining a large volume.
- e)** Experiments using dangerous chemicals must be carried out in fume cupboards.
- f)** Special precautions are needed with highly toxic volatile materials (e.g. HCN) or large quantities of flammable solvents. Never use naked lights or non-spark-free electrical appliances near flammable or explosive solvents. Experiments involving quantities of flammable solvents or any other hazardous material or procedures should not be conducted outside normal working hours (7.00 am - 6.00 pm). If you have to carry out a hazardous procedure, even during normal hours, make sure that your colleagues know what you are doing.
- g)** In the interests of safety, bulk chemicals and potentially hazardous chemicals in any quantity should **not** be carried in the passenger lifts. In addition:
 - i)** The following chemicals are banned from passenger lifts in any quantities: Strong acids and bases, volatile solvents, inflammable liquids and toxic solids.
 - ii)** No liquids of any kind may be carried in quantities greater than 1 L (except where the safety containers are used). Not more than 4 kg of any non-hazardous solid may be carried.
 - iii)** Large gas cylinders and filled cryogenic dewars are not permitted.Alternative arrangements to transport these items in the goods lift must be made with stores staff.
- h)** All quantities of acids, caustic, flammable or dangerous liquids should be transported in a "Winchester Carrier" to and from laboratories and stores in the goods lift.
- i)** Universal Sorbent Pillows are available. These pillows provide a method for control and pickup of spills of hazardous or problem liquids.

To use:

- i) Place an adequate number of hazard pillows directly on to the spilled liquid in order to pick up or contain the liquid.
- ii) Allow 5 to 10 minutes for complete saturation.
- iii) Using rubber gloves, remove pillows and take to store for their disposal, or if after hours place in an operating fumecupboard which is not being used.
- iv) Sand is also available.

2. Storage of Chemicals

- a) Bottles of oxidising and dangerous acids should be stored in a plastic tray. Strong acids should **not** be stored close to solvents.
- b) All flammable chemicals, unless in use, must be stored in the storage cabinets to comply with the Dangerous Goods Act.
- c) Bottles larger than one litre should **not** be stored on shelves above eye level.
- d) Winchester bottles whether empty or containing liquid should **not** be stored on the floor.
- e) The practice of storing materials in a fume cupboard is prohibited.
- f) The following chemicals should be stored in a "safe" cupboard and **not** held on laboratory shelves:

Cyanide, Arsenic compounds, Barbiturates, Mercury Salts, Strychnine, Pyridine etc.

3. Carcinogens

Every effort should first be made to find an alternative chemical which is not a carcinogen.

- a) *Storage of Carcinogenic Substances:* Containers should be placed in a polythene bag, sealed with sellotape and clearly labelled:
"CARCINOGEN" or 'SUSPECTED CARCINOGEN" and stored away from other chemicals.
- b) *Handling Carcinogens:* Personal protection is required to prevent any absorption through the mouth, lungs or skin.

4. Liquid Nitrogen and Solid Carbon Dioxide

Liquid nitrogen is a dangerous material. Safety spectacles should be worn when transferring it into or out of a vacuum flask, no matter what the quantity.

- a) Transporting: for the safety of yourself and others.
 - i) **Liquid nitrogen should never be transported via the staircase.**
 - ii) Up to **one** litre of liquid nitrogen in a Dewar flask covered with a lid can be carried in **the lifts**.

- iii) Volumes larger than one litre should be carried in containers secured on trolleys. If the trolley is to be transported between floors, then the lifts should be used. In this case, the trolleys should be sent in the lifts unattended, but with second person outside the lift door of the receiving floor ready to move the trolley out of the lift. A very large and conspicuous notice stating "**DANGER, DO NOT ENTER THE LIFT**" should be attached to the trolley, facing the lift doors (two notices in lifts with two entrances).
- b) All liquid nitrogen containers should be completely emptied at least twice a year, because of the gradual accumulation of liquid oxygen.
- c) Liquid nitrogen traps on vacuum lines tend to liquefy air passing through the trap as well as organic vapours, to give a dangerous combination. Do not draw air through a trap unnecessarily and always empty the trap immediately after use.
- d) Both liquid nitrogen and solid carbon dioxide must be stored in a ventilated area: never in a Cold Room.
- e) **Liquid air should never be used in the department.**

5. Oxygen

Ensure that oxygen cylinders are shut off securely when not in use, and that there are no leaks in an "oxygen system" when in use. The risk of fire is considerably increased by an oxygen enriched atmosphere.

6. Cyanide

Manipulations with cyanide salts must be carried out between 7.00 a.m. and 6.00 p.m. Before using cyanide obtain, read thoroughly the *Use of Cyanide*. Note that at least two people must be present in the area when cyanide is being manipulated.

First Aid Treatment

- a) **Rescuers: Caution - Cyanide gas is very toxic!** Where cyanide gas is involved, wear self contained breathing apparatus. For liquid, wear impervious protective gloves and clothing.
- b) Remove patient to a safe area.
- c) Phone Ambulance (112).
- d) **Decontamination:** Remove contaminated clothing and wash contaminated skin thoroughly with soap and warm water, then cover patient.
If cyanide has been swallowed, and the patient is conscious, they must drink large volumes of water.
- e) **Care:** If breathing is feeble or absent, establish a clear airway and apply artificial respiration by mouth to mouth method (when cyanide has been swallowed, mouth to nose may be safer). Once the patient is breathing unassisted administer amyl nitrite.
- f) **Antidote:** If patient is breathing, and seems severely affected by cyanide, amyl nitrite should be used.

7. Disposal of Chemicals

Information on the disposal of chemical wastes can be found in the library. Consult your supervisor if in doubt.

Each individual user carries the responsibility for checking on the properties and disposal methods for materials used. All bottles must be labelled and all wastes

delivered to the store must be labelled and rendered safe to handle by untrained personnel. A “**Waste Disposal Request Form**” is required for each item.

Water miscible solvents may be poured down the sink running plenty of water down the drain. All chemicals which cannot be disposed of *via* the drainage system must be neutralised and labelled, and returned to the store for disposal at a later date *via* a controlled land fill site.

Non water solvents must not be poured down the sink. They must be collected in "solvent residue" bottles, which will be emptied regularly. **Do not mix acetone and chloroform in the residue bottles; the resulting mixture may explode.** Solvent residues and other materials for disposal may be left in the designated area of the Store after advising the Storeman, who will reject the items if unsatisfactory for disposal. The Safety Officer will assist groups to dispose of hazardous, water immiscible and flammable materials, and should be consulted.

If you are about to leave the Department or complete a project, consult your supervisor about safe disposal of any hazardous chemicals which you may have remaining in your laboratory.

Also see Appendix A.

8. Accidents Involving Chemicals

For the safety of others, spillage of chemicals on benches or floors must be cleaned up immediately, irrespective of whether they are dangerous or not.

If a major spillage of a dangerous chemical occurs, warn other people to keep clear of the immediate area and seek assistance from the Safety Officer or someone from the list on page 12.

a) Chemical Contact with tissue

Chemicals coming into contact with the skin or other tissues usually require **immediate** action to dilute, flush away or neutralise the offending agent. Medical advice should be obtained after the following emergency action has been taken:

Acid in eye

Wash thoroughly with water then with 1% borax solution, using eye-bath.

Alkalies in eye

Wash thoroughly with water then with saturated boric acid solution, using eye-bath.

Acid or Alkali on other part of body

Wash thoroughly with water and then with borax or boric acid solution.

b) Poisons if swallowed

Acids

Quickly wash out mouth with water; give plenty of water to drink to wash throat then milk of magnesia at intervals. *Do not give emetics.*

Alkalies

Quickly wash out mouth with water; plenty of water to drink to wash throat then give 1% solution of acetic acid. *Do not give emetics.*

Heavy metal salts, oxalic acids and oxalates, permanganates, bromine and iodine

Flush with plenty of water and drink copious amounts of water.

c) Poisons if in mouth but not swallowed

Spit out and rinse the mouth repeatedly with water.

Remember that many poisons can be absorbed through the lungs or skin: for example, hydrogen sulphide (lungs) or aniline (skin) can both prove fatal in sufficient quantities.

Appendix A

Disposal of Chemical Wastes Policy

Particular Examples of Toxic Waste Disposal

The methods of disposal are listed in general order of preference.

Type of Toxic Waste	Special Considerations	Methods of Disposal
Acids	Corrosive properties	Neutralise with, for example, calcium carbonate before discharging into sewer.
Acid tars and highly acidic organic residues	Low solubility makes these suitable for burying.	Bury in an 'approved' tip.
Alcoholic waste	Liquid wastes should be in impervious containers before burying.	<ol style="list-style-type: none"> 1. Incineration 2. Discharge of diluted waste to sewer.
Alkaloid wastes	Varying chemical nature. The toxic components should be identified.	<ol style="list-style-type: none"> 1. Incineration 2. Bury in an 'approved' tip.
Aromatic hydrocarbons	The toxic components should be identified. Hazards may arise from toxicity, volatility, flammability, persistence or a combination of these factors.	<ol style="list-style-type: none"> 1. Re-use 2. Incineration
Arsenic waste including sawdust and ash from arsenically treated timber	Being a heavy metal arsenic is particularly persistent and when choosing a disposal method much consideration must be given to possible long-term effects of accumulation. If possible soluble arsenic salts should be converted to insoluble salts (for example sulphides).	<ol style="list-style-type: none"> 1. Re-use – for example, Ceramics or glass manufacturing industries. 2. Bury in an 'approved' tip (as in insoluble salt). 3. Incineration under controlled conditions at approved sites. Ash must still be disposed of at an 'approved' tip.
Beryllium wastes	Highly toxic. If burying convert to an insoluble salt (for example acetate hydroxide or oxide).	<ol style="list-style-type: none"> 1. Re-use – e.g. in glass industry, in alloys or as a catalyst for organic reactions. 2. Bury in containers in an 'approved' tip.

Carbides (acetylides)	Explosive hazard – sensitive to shock, friction and heat. Reacts violently with water.	Contact Explosives Branch of Department of Internal Affairs.
Chlorocresols and chlorphenols	Have bactericidal properties – could be very hazardous if discharged into sewer.	1. Incineration
Chromic acid (chromium trioxide)	Powerful oxidiser: If in contact with combustible material it may cause fire.	Detoxify by converting to comparatively innocuous chromic salt. Re-use or bury in an 'approved' tip.
Cyanide wastes	High toxicity and volatility.	Detoxify with chlorine or hypochlorite. Discharge diluted waste to sewer.
Diaminodiphenyl-methane		1. Re-use, e.g. Dye industry. 2. Incineration 3. Bury in an 'approved' tip.
Fluorides	Inorganic fluorides are highly toxic and irritant	1. Re-use, for example glass industry. 2. Bury as one of the less soluble salts if possible.
Lacquer	May contain lead acetate. If so, convert to less soluble sulphate before burying.	1. Incineration 2. Bury in a 'approved' tip.
Leaded petrol sludge		Bury in an 'approved' tip.
Lubricants	Considerable variation in types and formulations.	1. Re-use, e.g. as fuel. 2. Incineration
Mercaptans	When heated to decomposition they emit toxic fumes of SO ₂ /SO ₃ . Will react with water, steam or acids to produce toxic and flammable vapours. They can react with oxidising materials. Vapours are particularly malodorous, for example, Parnell incident.	1. Incineration

Nicotine waste	Highly toxic. Must not be tipped into sewer.	1. Incineration 2. If possible destroy chemically before burying in an 'approved' tip.
Oil-impregnated rubbish	On no account dump at sea	Bury in an 'approved' tip.
Oil waste	On no account dump at sea	1. Re-use, <i>e.g.</i> as fuel in central heating unit. 2. Bury in an 'approved' tip.
Organic solvents	Highly volatile. Vapours may be flammable and toxic.	1. Redistil and re-use. 2. Incineration 3. Evaporation (until incinerator available)
Paint waste		1. Bury in an 'approved' tip. 2. Incineration 1. Incineration – Special care is required. 2. Bury in an 'approved' tip.
*Pesticides or residues from pesticide formulations.	Organochlorines must not be dumped at sea or discharged into sewer.	
Plating sludges	May contain cyanides	1. Detoxify with chlorine or hypochlorite. 2. Bury in an 'approved' tip.
Sludges containing copper, zinc, cadmium, nickel, or their compounds	Detoxify and restrict the spread of metals by converting soluble to insoluble salts.	Bury in an 'approved' tip.
Sodium acetylide		See "carbides"
Solid tarry matter		Bury in an 'approved' tip.
Sulphides	Heavy metal sulphides are generally insoluble and may be buried safely although there could be a slow release of hydrogen sulphide. The other sulphides may react violently with water or with oxidising agents. These should preferably be oxidised before burying.	1. Re-use if possible. 2. Bury in an 'approved' tip.
Tarry liquids	On no account dump at sea.	1. Incinerate 2. Bury in an 'approved' tip.

White spirit	Re-use in heating units for example would be too dangerous because of flash point.	<ol style="list-style-type: none"> 1. Re-distil if in sizeable quantity. 2. Small quantities may be safely disposed of by evaporation.
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* **Spillage of Organophosphates**

Spilled organophosphorous wastes should be initially contained by 'bordering' with an inert absorptive material such as hydrated lime, sawdust, clay or fuller's earth.

Detoxification should be carried out by adding copious quantities of caustic soda and the resulting hydrolysis product taken up with more inert material and transferred to drums which should be buried in an 'approved' tip.

All workers engaged in these clearing up operations should be provided with full protective clothing including eye protective and respiratory protective equipment.

Appendix B

Policy Statement on Occupational Health, Safety and Loss Control

1. The University regards the promotion and maintenance of occupational health, safety and loss control as mutual objectives for everyone who works, studies, visits or has business on the university campus and field stations and University properties.
2. The University is dedicated to the provision of a safe and healthy working environment and to the conduct of all its activities in a safe manner to prevent harm to persons, damage to property or disruption to programmes and processes.
3. The University will do all that is reasonable and within its powers to:
 - a) provide and maintain a healthy and safe working environment;
 - b) provide training and instruction in occupational health and safety and loss control matters;
 - c) provide suitable safety devices and protective equipment to further these aims;
 - d) promote occupational health and safety standards
 - e) encourage participation in monitoring, improvement and promotion programmes established to enhance health and safety standards.
4. Staff, students and all persons who have business at the University are considered by the University to have a duty to co-operate in the maintenance of a safe and healthy environment at all times by:
 - a) working safely and effectively with due regard to the effects of their efforts on others;
 - b) adhering to statutory safety regulations, University rules and standard operating procedures;
 - c) using and maintaining all equipment and facilities provided in the correct manner and reporting any unsafe conditions or defects found immediately;
 - d) participating in health and safety programmes, through committee membership, courses of instruction and safety investigations and audits, if called upon to do so.
5. The University relies on Heads of Departments, Section Heads, Unit and Centre Supervisors and laboratory supervisors and others in positions of responsibility for vigilance, motivation and enforcement of safety and health practices and especially to be alert to the desires of those in their care for a safe work environment.

Appendix C

Definitions

Carcinogenic

Refers to something that can cause cancer.

Mutagenic

Refers to something that induces genetic mutation.

Mutation is defined as

- i) A process by which a gene or some other DNA sequence undergoes a change in structure.
- ii) A gene or other DNA sequence that has undergone a structural change.
- iii) An individual that has undergone a mutational change and expresses this change in the phenotype.

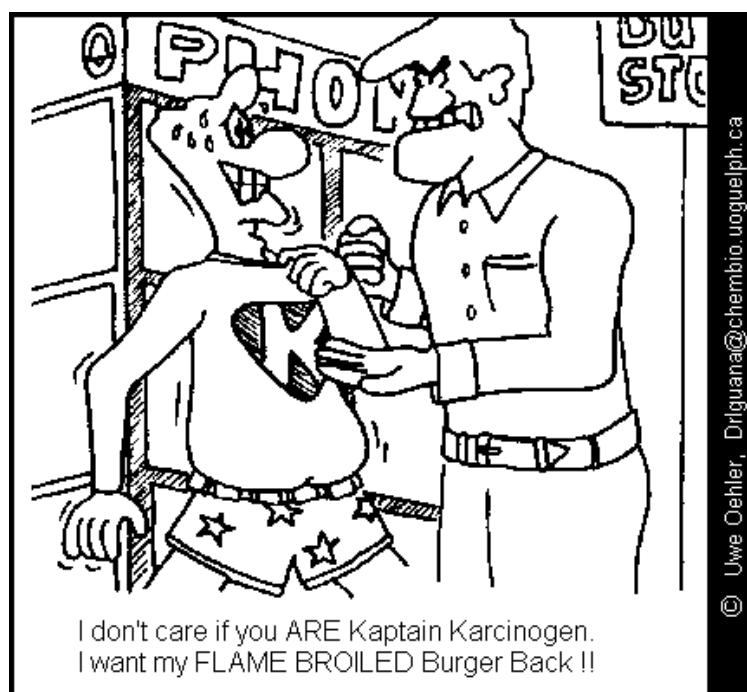
Teratogenic

A substance or drug producing abnormal embryos ie tends towards teratogenesis.

Teratogenesis is defined as

The development of an abnormal mass of cells composed of diverse, differentiated and undifferentiated cell types during foetal development, causing physical defects in the foetus.

Both mutagenic and teratogenic compounds have reproductive effects.



Appendix D

Chemical Classification and Description

Class 1 – Explosive



Class 2.1 – Flammable gases

Class 2.2 – Non Flammable gases

- cryogenic liquids
- other gases

Class 2.3 – Poisonous gases

- cyanogen, cyanogen chloride, hydrocyanic acid, nitrogen dioxide, phosgene.
- other gases

Class 3 – Flammable liquids

Class 4.1 – Flammable solids

Class 4.2 – Spontaneously combustible

Class 4.3 – Dangerous when wet

Class 5.1 – Oxidising agent

Class 5.2 – Organic peroxides

Class 6.1 – Poison

Class 6.1 – Harmful

Class 6.2 – Infectious Substance



Class 7 – Radioactive materials



Class 8 – Corrosives



Class 9 – Miscellaneous hazardous substances



Other common labels on chemicals:

Pictograms



Explosive



Oxidizer



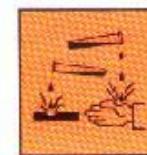
Flammable



Toxic



Harmful or
Irritant



Corrosive



Environmentally
Toxic