QUEEN'S UNIVERSITY

DEPARTMENT OF CHEMISTRY

UNDERGRADUATE SAFETY MANUAL

Required for Use in All Undergraduate Chemistry Courses

IN CASE OF EMERGENCY

FROM WITHIN THE UNIVERSITY 36111

FROM OUTSIDE THE UNIVERSITY 533-6111

July 2007.

Safety in the Chemical Laboratory

The following Rules have been adopted by the Department of Chemistry and apply to all undergraduate laboratories.

1. All staff and students working in laboratories share the responsibility for safety.

2. Safety goggles will be worn in all laboratories. Protective clothing will be worn as specified; open-toed shoes and sandals are not to be worn; long hair and loose clothing must be confined by net, cap or laboratory coat. Contact lenses are not recommended as they can prevent washing the eye in an emergency.

3. Horseplay, pranks and unauthorized experiments are especially dangerous and are prohibited.

4. Demonstrators shall know ahead of the laboratory period what experiments are scheduled and be cognizant of the correct working procedures.

5. No eating, drinking or smoking is permitted in any laboratory or in any other place where exposure to any toxic substance may occur by inhalation, through skin contact or by ingestion.

6. Demonstrators shall ensure that all persons using a laboratory know where the exits are, the locations of safety showers, eye-baths, and fire extinguishers, and what to do if the fire alarm sounds.

8. All supervisory personnel in a lab shall know where the nearest telephone is (emergency or open).

9. Chemicals from unlabelled containers are not to be used (except "unknowns" labeled as such and prepared for analysis or other such examples provided for some particular pedagogical purpose). The presence of any unlabelled containers should be reported to the technician, demonstrator or faculty supervisor.

10. All work areas shall be kept clean. Separate containers are to be used for paper and broken glassware.

11. All persons shall report accidents promptly to the supervisor, demonstrator, instructor or laboratory technician who will supervise first aid and/or arrange for further medical attention. (This is essential for the reporting required by Workman's Compensation Board.) First Aid instructions are posted in laboratories and adjacent corridors.

12. Visitors to laboratories are required to follow the same rules as staff and students.

13. Personal media devices which employ the use of headphones are strictly forbidden from use at any time in the undergraduate labs.

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INTRODUCTION

Safety is Primarily Your Responsibility.

The dangers inherent in any chemical procedure are significantly reduced when the chemist is informed as to the problems to be anticipated. **Prior to your arrival at the laboratory you are to become familiar with the instructions provided for each laboratory exercise**. In the laboratory you are to follow those instructions carefully so as to make the laboratory as safe as possible. Some general rules of laboratory operation are given below.

Safety Goggles

Safety goggles must be worn at all times while in the laboratory. Contact lenses are not recommended; they are a serious hindrance to washing the eye should some chemical or object contact it.

Clothing

From time to time reagents which can damage your clothing or skin will be used in experiments. **The use of a laboratory coat is strongly recommended.** Arms, legs, and feet **must** be covered while in the laboratory. Hair which is shoulder-length or longer must be tied back and confined so as to minimize the chance of coming into contact with chemicals or a heating apparatus. Some laboratory procedures will require the use of protective rubber or plastic gloves. Space in the laboratory is strictly limited and it is important to minimize clutter and to protect your books and clothing by not bringing extraneous articles to the laboratory. All labs have coat racks and space for bags and backpacks at the lab entrances. Please make use of these facilities.

Deportment

The laboratory involves some inherent, unavoidable dangers that are easily manageable with the instruction and training you will receive. Therefore, students are to conduct themselves in an orderly manner having due regard for the nature of the work being performed. Failure to do so will result in expulsion from the laboratory. Note carefully that **Academic Regulations 9 (Attendance, Coursework and Conduct) and 12 (Academic Dishonesty)** apply specifically and fully to laboratory work. While in the laboratory students are under the supervision of Teaching Assistants and a Laboratory Supervisor whose instructions pertaining to the laboratory work are to be obeyed. Students must perform their laboratory work at the site(s) assigned to them.

Accidents

All accidents must be reported promptly to the Laboratory Supervisors, Dr. M. Mombourquette (1st Year Labs), Dr. H. S. Tilk (Synthetic labs) or Dr. I. Kozin (Physical/Analytical labs). Basic First Aid material is available from the Laboratory

Technicians, Dr. E. R. Ison and Lyndsay Hull (Room CHE118), Len Rose and Tom Hunter (Room CHE 208).

Cuts

Always wash minor cuts thoroughly under running water. Remove any foreign objects from the wound. Apply pressure until the bleeding stops. However, if a severe cut is suffered call immediately for assistance from another student, your Demonstrator, or the Laboratory Supervisor; clean the wound as quickly as possible; apply pressure and obtain medical assistance.

Heat Burns

Immediately hold the affected area under a gentle flow of cold water for several minutes. If blistering occurs cover lightly with a sterile bandage and obtain medical assistance immediately.

Chemical Burns

Immediately wash the area with a detergent solution and then treat as a **heat burn.**

Fire

Immediately warn those in the area by calling out "Fire!" and leave the area so as to permit the Demonstrator, Technician, or Supervisor to deal with the situation. Do not attempt to extinguish the fire yourself.

Spill

In the event that a compound, reagent, or reaction solution is spilled on a bench or floor, notify your Demonstrator. Get advice as to how to clean up the spill.

DISPOSAL OF CHEMICALS (INCLUDING SOLVENTS**)**

Specific instructions are provided under the **clean-up** section of each experiment.

Organic Liquids and Organic Solutions

No organic liquid or solution may be poured down the drain. All organic liquids and organic solutions are to be disposed of in the large LIQUID ORGANIC-WASTE containers, which are located in each laboratory.

Aqueous Solutions **(including acids and bases)**

All solutions using water as the solvent---and this includes all of the strong acids, such as HCl and H_2SO_4, and bases, such as NaOH and ammonium hydroxide---should be poured down the drain with copious amounts of cold tap water.

Solid Waste Other Than Glass or Paper

A SOLID ORGANIC WASTE container is located in a fume hood in the synthetic laboratory. All solid waste, except for paper and glass, is to be placed in these containers.

Glass

Do not attempt to pick up broken glass in your hands. Use a brush or broom and a dustpan to collect the broken glass. Broken glass is to be placed in **specially marked** GLASS WASTE containers located in each laboratory. Do **NOT** place anything except broken glass in these containers. After use, **disposable (Pasteur) pipettes** should be rinsed and placed in the DISPOSABLE PIPETTE container.

Paper

Filter paper, paper towels, and other paper waste may be placed in the plastic garbage bags located under or near the sinks in the laboratory. DO NOT put broken glass in these garbage bags or in the organic waste containers.

Sharp Objects

Sharp objects such as syringe needles cannot be disposed of in conventional waste containers. They must be collected in an appropriately labeled ("SHARPS") metal or plastic container for disposal. Separate waste containers are provided for broken glass.

Chemical Laboratory Safety

There are over 10 million known chemical substances with more being continually discovered; the hazardous properties of most of these substances have not been investigated. There are however many classes of compounds that are known to present certain hazards such as

- oxidizing agents and reducing agents
- corrosives such as acids and bases
- water reactive chemicals
- air reactive chemicals
- self-reactive chemicals
- highly toxic chemicals

This manual will describe general procedures and protocols for dealing with common hazards in the chemical laboratory. For detailed information on the handling and disposal of specific chemical substances, the following references, available through Queen's University Libraries, should be consulted:

"Hazardous Chemicals Handbook", P. A. Carson & M. J. Mumford (electronic access)

"Hazardous Chemicals: Information and Disposal Guide", M. A. Armour, L. M. Browne and G. L. Weir, University of Alberta.

"Handbook of Reactive Chemical Hazards", L. Bretherick, Butterworths.

"Sax's Dangerous Properties of Industrial Materials", R. J. Lewis, Sr., editor, Van Nostrand Reinhold.

"Hazardous Chemicals: Desk Reference", R. J. Lewis, Sr., Van Nostrand Reinhold.

"The Sigma-Aldrich Library of Chemical Safety Data", R. E. Lenga, editor, Sigma-Aldrich Co.

"Prudent Practices in the Laboratory: Handling and Disposal of Chemicals", National Research Council, National Academy of Sciences, Washington, 1995.

Material Safety Data Sheets

The provision by chemical manufacturers of material safety data sheets (MSDSs) for hazardous materials is one means of communicating information on chemical hazards; chemicals purchased directly from a chemical supplier will be accompanied by an MSDS. In addition, various electronic MSDS databases are available at Queen's University through links on the Department of Environmental Health and Safety Website.

1. General Chemical Hazards

1.1 **Corrosivity**

Corrosive chemicals cause visible destruction or irreversible alteration to living tissue. Common acids and bases are the most common corrosives encountered, but other chemicals such as Br_2 are also extremely corrosive.

- concentrated acids and bases should always be diluted by addition to water due to the large heat of solution for these compounds
- **use appropriate personal protective equipment and fumehood ventilation when working with strong acids and bases, and other corrosive substances**
- safety glasses do not provide complete eye protection from chemical splashes; wear appropriate safety goggles or splash shields when working with corrosive substances

NOTE: some specific acids such as HF (extremely toxic) and $HClO_4$ (powerful oxidizer of organics) require special handling procedures. Consult the appropriate references and your supervisor before working with these chemicals.

1.2 **Flammability**

The risk of fire in the chemical laboratory is most often associated with two classes of compounds - common organic solvents, and certain metals, metal hydrides and organometallics. For common organic solvents the following should be noted:

- the minimum temperature at which vapours from a substance will ignite in air when exposed to an ignition source (flame, spark, static discharge, etc.) is called the flash point
- a flammable substance has a flash point below 37.8°C
- a combustible substance must be heated at or above 37.8°C to ignite
- bottles of flammable liquids up to 1L in size can be stored anywhere in laboratories; larger quantities must be stored in flammable storage cabinets (e.g. 4L bottles) or in approved safety containers
- the maximum volume of (flammable + combustible) liquids that may be stored in the open lab is 300 litres; the maximum allowable amount of flammable solvents is 50 of the 300 litres
- flammable waste solvents cannot be collected in the open lab in containers larger than 1 litre capacity
- always use ventilation (e.g. fumehoods) which is adequate for the quantity of flammable liquid in use
- always connect (or bond) containers when transferring flammable liquids from metal containers
- **only refrigerators/freezers that are approved for flammable storage can be used in laboratories**

Alkali and alkaline earth metals, certain other metals such as **aluminum**, metals in a finely divided form, **metal hydrides** and many **organometallic compounds** can ignite on exposure to air and/or water. The following should be noted when working with this class of compounds:

- store these chemicals in a location separate from other chemicals in the laboratory and in containers appropriate for the purpose
- use equipment appropriate for the hazards associated with these substances including inert atmosphere techniques
- class "D" fire extinguishers (metal fires) must be present in laboratories where these substances are in use; do not use "C" class fire extinguishers (CO_2) on metal fires

1.3 Noxious Chemicals

Certain classes of compounds such as **thiols (mercaptans)** and related sulfur-containing compounds are characterized by a particularly noxious odour

- these compounds must be used with adequate ventilation (fumehoods)
- whenever compounds of this type are used they will be released through the ventilation system into the local atmosphere, consequently both the Department Safety Officer and the Emergency Report Centre must be notified in advance of the use of these chemicals

1.4 Reactive Chemicals

Air/Water Reactive

- chemicals which can ignite on exposure to air or water, e.g. certain metallic and organometallic substances, phosphorous
- special handling, storage and disposal procedures must be established in laboratories where these substances are in use (see section on **Flammability**)

Self-Reactive Chemicals

- may be heat, shock or friction sensitive and can react violently as a consequence, e.g. acetylene and acetylides, azides, diazonium salts, nitro compounds, chlorates and perchlorates, peroxides
- special handling, storage and disposal procedures must be established in laboratories where these substances are in use

Lachrymators

- substances which react with moisture in the eyes and mucous membranes to cause tear formation, e.g. halogenated aldehydes, ketones and esters
- must be used with adequate ventilation (fumehood) and stored in well sealed containers

Incompatible Chemicals

Accidental contact of incompatible chemicals can lead to fire, explosion and/or the release of highly toxic substances. The magnitude of the problem usually increases with the quantity of

chemicals being stored. Prudent practice requires that incompatible chemicals be stored in separate locations to minimize the risk of accidental mixing.

Oxidizers (e.g. chromates, halogens, peroxides) and **reducers** (e.g. metals, metal hydrides, phosphorous, sulfur) are incompatible with each other and should be stored in separate cabinets or on separate shelves. Strong oxidizers should also be separated from flammable liquids

1.5 **Toxicity**

A wide range of substances are present in the chemical laboratory which present a risk due to either chronic or acute toxicity; this includes the presence of carcinogens, mutagens and teratogens.

- toxic substances may enter the body by inhalation, absorption, ingestion and/or injection
- appropriate protective measures must be taken to prevent exposure and which are consistent with permissible exposure limits for a specific substance
- where available, antidotes for poisons must be present during usage of these poisons

NO FOOD OR DRINKS ARE TO BE CONSUMED IN LABORATORIES UNDER ANY CIRCUMSTANCES

CONTAINERS/UTENSILS USED FOR THE PREPARATION OR CONSUMPTION OF FOOD OR BEVERAGES MUST NOT BE STORED IN THE OPEN IN LABORATORIES

1.6 **Designated Substances**

The Occupational Health and Safety Act allows a biological, chemical or physical agent, or combination thereof, to be “designated” and its use in the workplace may be either prohibited or strictly regulated. Regular reporting on inventories of these substances may be required. The following are designated substances:

ACRYLONITRILE
ARSENIC
ASBESTOS
BENZENE
CARBON DISULFIDE
CARBON TETRACHLORIDE
COKE OVEN EMISSIONS
ETHYLENE OXIDE
ISOCYANATES
LEAD
MERCURY
SILICA POWDER
STYRENE
VINYL CHLORIDE MONOMER

Acrylonitrile, benzene, carbon disulfide, carbon tetrachloride, isocyanates, styrene, and vinyl chloride monomer are all volatile organic materials and must be used with adequate ventilation (fumehood) to prevent exposure through inhalation and with appropriate protective equipment to prevent exposure through skin absorption. These materials can be disposed of in the normal liquid organic waste stream (halogenated or nonhalogenated as appropriate).

Substances containing **arsenic, lead or mercury** must be handled in an appropriate manner to prevent exposure through inhalation or absorption. All chemical waste containing arsenic, lead or mercury must be collected and properly labeled for disposal by the Department of Environmental Health and Safety.

Elemental mercury is used in many types of apparatus, in particular mercury-filled thermometers. Mercury spills from broken equipment should be cleaned up immediately (mercury spill kits are available from the Department of Environmental Health and Safety). Broken thermometers are collected by lab technicians, who will recover the mercury from the thermometers before disposal.

Silica powder, including chromatography grade silica, is a respiratory hazard and should be handled in a fumehood when dry. Used silica should be stored in sealed and labeled containers then sent for disposal by the Department of Environmental Health and Safety.

2. Safe Laboratory Procedures and Techniques

2.1 **Glassware**

In general glassware used for standard laboratory procedures is made of borosilicate glass. Prior to carrying out an experiment the following should be done:

- check glassware for cracks, chips and other flaws; these flaws should be repaired before the glassware is used
- select the right glassware for the job: vacuum applications required thick-walled glass while operations carried out under pressure require specially designed glassware
- glassware under pressure or vacuum should be shielded
- if it is necessary to apply pressure to glassware, wear thick leather gloves
- never heat or apply pressure/vacuum to a chemical in a stock bottle; these bottles are made of a soft glass which breaks readily

2.2 **Electrical Equipment**

In addition to the hazards posed by electrical shock, electrical equipment also presents a source of fire hazard when used in conjunction with flammable substances (see section on **Flammability**). Electrical hazards can be minimized by the following:

- only trained or qualified individuals should repair or modify electrical equipment
- electric wires should never be used as supports
- unplug equipment by pulling on the plug not the cord

- equipment should be regularly inspected and frayed cords or broken plugs should be repaired
- any equipment failure or overheating should be remedied immediately
- use “C” class fire extinguishers for electrical fires

2.3 Static Electricity and Spark Hazards

Protection from static discharge must be addressed in particular when handling flammable solvents; this risk is increased during periods of low humidity. Proper grounding of containers and equipment will significantly reduce this risk. Common potential sources of sparks and static discharges are:

- ungrounded metal tanks and containers
- clothing or containers made of plastic or synthetic materials
- high pressure gas cylinders upon discharge
- control systems on hotplates
- brush motors and forced air dryers

2.4 UV Lamps

Radiation of wavelengths below 250 nm poses a considerable risk to both eyes and exposed skin. Wear UV-absorbing safety glasses and avoid direct eye contact with the UV source; wear protective clothing to prevent burns from UV exposure. Work involving UV irradiation should be carried out in an enclosed work area to prevent exposure of workers to the UV source.

Mercury arc lamps should be cleaned thoroughly before use. Handling with bare hands leaves oil deposits on the surface of the outer glass which form residues that will burn into the glass causing buildup of heat during the operation of the lamp. The lamp may overheat and crack, releasing mercury vapour as a consequence.

2.5 Lasers

The Department of Environmental Health and Safety runs a “Laser Safety Program”. All personnel working in proximity to Class 3b or Class 4 lasers must complete this program before starting work with lasers.

The type and intensity of radiation available from a laser varies greatly from one instrument to another. The following general rules should be followed:

- always wear goggles that offer protection against the specific wavelength(s) of the laser in use; no available goggles protect against all laser wavelengths
- never look directly at the beam or pump source
- never view the beam pattern directly; use an image converter or other safe, indirect means
- do not allow objects that cause reflections to be present in or along the beam
- keep a high general illumination level in areas where lasers are in operation; low levels of light cause dilation of the pupils, thereby increasing the danger to the eyes

- display warning signs

2.6 Radiation Safety and X-ray Generators

The Principal of Queen's University has appointed the University Radiation Safety Committee to carry the advisory responsibility for the overall operation of the University Radiation Safety Program. The details are included in the Terms of Reference of the Committee. It is the policy of Queen's University that all activities involving ionizing radiation or radiation emitting devices be conducted so as to keep hazards from radiation to a minimum. Persons involved in these activities are expected to comply fully with the Atomic Energy Control Act and all its regulations, with the Occupational Health and Safety Act and its regulations regarding X-ray sources, lasers and sound. Radiation Safety Policy and Procedures are available through the Department of Environmental Health and Safety.

X-rays are a hazardous physical agent under the Occupational Health and Safety Act. Any equipment generating X-rays must be operated in accordance with government regulations and appropriate warning signs must be posted.

2.7 Magnetic Fields

NMR spectrometers have superconducting magnets which generate static magnetic fields with high flux densities. Hazards exist from the mechanical forces exerted by these magnetic fields on ferromagnetic tools and equipment and on medical implant devices. Individuals with implanted cardiac pacemakers and similar medical devices should not be exposed to these magnetic fields. Other implanted medical devices such as suture staples, aneurysm clips, prostheses, etc. may also be subjected to adverse effects.

2.8 Compressed Gases

Gases used in laboratories are supplied in cylinders at high pressure; lecture bottles are not permitted. In addition to any potential chemical hazards, compressed gases are a high-energy source and therefore hazardous. The following rules must be followed:

- cylinders of all sizes must be restrained from falling by restraining devices
- during storage or transport, the cylinder cap must be in place
- cylinders must only be transported when strapped to a wheeled cart
- no lubricant shall be used when connecting the regulator to the cylinder
- new connections shall be checked for gas leakage
- the cylinder delivery pressure shall be set to zero after the main cylinder valve is closed to prevent a rapid release of compressed gas the next time the cylinder is opened
- empty cylinders shall have the regulators removed, be marked MT, the shipping cap replaced and returned to Chemistry Stores
- unused or partially used cylinders that are of no further use shall be returned to Chemistry Stores
- in the event of a fire, the supply of a combustible gas shall be shut off before any attempt is made to extinguish the flame

- a trap shall be used to prevent the back siphoning of solution when a soluble gas is being employed
- do not expose cylinders to temperatures higher than 50°C
- use toxic, flammable or reactive gases in a fumehood
- use the appropriate regulator for the type of gas
- be aware that special handling procedures are required for certain gases, e.g. acetylene

2.9 **Cryogenics and Cold Traps**

Liquid nitrogen is the most common cryogenic coolant and must be handled with caution. The following points must be taken into account when using liquid nitrogen

- use only a properly vented container
- extreme cold can rapidly cause tissue damage; use appropriate protective equipment
- spills in confined spaces can cause asphyxiation due to rapid evaporation of the nitrogen
- glass Dewars used as cold traps should be encased to contain glass fragments in the event of implosion
- do not leave liquid nitrogen cold traps open to the air; oxygen may condense from the air and can react explosively with combustible materials

Dry ice is frequently used in conjunction with a cooling liquid. These cooling systems can also cause tissue damage due to extreme cold. The proper choice of a cooling liquid presents problems since a nontoxic, nonflammable, low viscosity, low volatility liquid does not exist. In general isopropanol (flash point 11°C) is preferable to acetone (flash point -18°C) due to a higher flash point but still represents a fire hazard. A 3:2 mixture of ethylene glycol to water which is thinned with isopropanol is an alternative cooling liquid with reduced flammability.

2.10 **Reduced Pressure Operations and Vacuum Pumps**

- vacuum desiccators should be taped or encased due to the risk of implosion
- glass vacuum lines should be shielded when in use
- cold traps should be placed between apparatus and vacuum pumps to prevent volatiles from entering the pump oil; traps should be cleaned after use
- exhaust from pumps should be vented into a ventilation control system, not into the open lab; this includes venting of PIAB compressed air vacuum apparatus
- pump belt drives must have a guard over the belt to prevent anything from getting caught in the belt

2.11 **Distillations and Reflux Operations**

Distillations and reflux operations are common laboratory procedures which present several potential dangers: pressure buildup leading to explosions if closed systems are used, and fire hazards associated with heating flammable substances are two of the most common. A variety of apparatus designs are available to accomplish reflux/distillation operations at atmospheric pressure, under inert atmospheres, under reduced pressure and by the addition of steam. The following general points should be noted when carrying out these operations:

- check the integrity of the system; leaks of flammable materials can lead to fires

- ensure smooth boiling through stirring or the addition of boiling stones (do not add boiling stones to hot liquid)
- choose an appropriate heat source - electric heating mantle, ceramic cavity heater, steam bath or silicone oil bath
- do not heat the heat source above the autoignition temperature of the liquid being distilled/refluxed
- do not distill organic liquids to dryness

2.12 **Biohazard Safety**

The University Biohazards Committee, on behalf of the University, will determine the nature of biohazardous work in progress or proposed, accredit the facilities on an ongoing basis, assist the design of appropriate laboratories and training of personnel, and serve as an educational resource to members of the University community. The University has adopted the Laboratory Biosafety Guidelines, whether or not the work is externally funded and whether or not the sponsoring agency requires such certification.

Members of the University community who are contemplating, or who are presently engaged in work which might fall within these Guidelines are required to contact the Chair or Secretary of the Committee if they have not already done so.

2.13 **Microwaves**

Microwave radiation is a potentially harmful physical agent. The following general points should be noted when using microwave sources:

- do not attempt to use microwave ovens with the door open
- do not use metal containers in microwave oven
- ensure that seals around doors are clean and undamaged
- microwave equipment should only be modified or repaired by qualified personnel

3. Safety Equipment and Emergency Procedures

A variety of protective measures are available for dealing with the hazards present in the chemical laboratory. One of the simplest measures to reduce or eliminate a hazard is to substitute a less hazardous or non-hazardous material for one which presents a high level of risk. For example many older literature procedures may use solvents such as benzene or carbon tetrachloride for routine applications; it is now known that benzene is a potent carcinogen and that carbon tetrachloride can cause serious liver damage. Substitution of these solvents with toluene or dichloromethane may pose less risk if compatible with the procedure.

A second measure is to reduce the scale of an operation to reduce the level of risk. Smaller reactions are less likely to cause serious accidents if something goes wrong; they also produce less waste.

3.1 **Fumehoods**

The most common method to prevent exposure to hazardous chemicals by inhalation is to work in a ventilated work space provided in a fumehood. Protection is provided by air flow through the fumehood. Annual inspection and servicing is carried out on fumehoods to ensure proper operation however it is important to note that the protection offered by a fumehood can be compromised if the sash is opened too high or if the airflow is obstructed by equipment or chemicals stored in the fumehood. Keep the following points in mind when using a fumehood:

- keep all apparatus at least six inches from the front of the hood; airflow is less likely to be impeded and vapours are less likely to escape
- don't use the hood to store chemicals and equipment; they restrict airflow
- make sure that the airflow monitor/alarm is functioning properly
- proper fumehood ventilation of labs requires that doors to the lab be kept closed
- sash should be kept at a safe operating height

NOTE: it is an offence under the *Occupational Health and SafetyAct* to disable any protective device such as the airflow monitor/alarms on fumehoods. Any fumehood without a properly functioning airflow monitor/alarm must not be used.

3.2 **Local Ventilation**

Flexible ventilation ducts with flared openings can also be used to provide ventilation in local areas, particularly with equipment which, because of size or function, cannot be placed in a fumehood. Any equipment which releases hazardous fumes during operation must have local ventilation.

3.3 **Personal Protective Equipment**

Eye and Face Protection

The minimum requirement for eye protection is that safety glasses (or prescription glasses) fitted with side shields must be worn in labs when hazardous chemicals are in use. Safety glasses do not provide complete protection to the eyes from spills and splashes. Where more protection is required, such as when working with corrosive substances, either safety goggles or a full face shield may be recommended.

Clothing

Appropriate clothing and shoes are part of your protective equipment. Short pants and open-toed shoes or sandals offer no protection from spills of hazardous chemicals. Shoes that cover the feet completely and long pants or a lab coat must be worn.

Gloves

Gloves are available in a variety of materials including natural rubber, neoprene, nitrile and vinyl. Each type of material is resistant to only a limited range of chemicals therefore no single type of glove is suitable for all situations. Wearing the wrong type of glove can cause more damage by keeping chemicals in contact with your skin. Consult manufacturers data before selecting the appropriate type of gloves.

NOTE: Disposable **latex rubber gloves** are permeable or reactive to a variety of common chemicals including benzene, carbon tetrachloride, chloroform, chromic acid, ethyl ether, hexane, methylene chloride, naphtha, nitric acid, styrene, sulphuric acid, tetrahydrofuran, toluene, and xylene. They are **not recommended for use with these chemicals**.

Respirators

Respirators are designed to protect the wearer from hazardous vapours or dust. A wide variety of respirators are available and are designed to deal with different substances in various situations. The use of respirators requires proper selection, fitting and training which must be arranged through the Department of Environmental Health and Safety

Hearing Protection

Routine exposure to noise in excess of 90dB requires the use of hearing protection (i.e. ear plugs, ear muffs); for extended exposure to noise in excess of 80 dB, hearing protection is advised.

3.4 Emergency Equipment

Eyewash Fountains and Showers

Eyewash fountains and showers are located in the corridors outside research labs, and have instructions for their use posted. Access to this equipment must not be obstructed in any way. Additional safety showers are located in the washrooms at the end of each research corridor.

If it is necessary to use an eyewash fountain, hold your eyelids open with your fingers and roll your eyes back and forth while washing them. Flush your eyes for at least 15 minutes to ensure removal of the chemical.

If it is necessary to use an emergency shower, activate the shower for preliminary decontamination, then proceed to a shower located in a washroom to remove contaminated clothing as rapidly as possible.

Fire extinguishers

All laboratories are equipped with “C” class fire extinguishers which are suitable for most fires except metal fires; those labs with significant quantities of pyrophoric metals are also equipped with “D” class extinguishers. These extinguishers are only designed to fight small local fires. Do not attempt to fight large fires; evacuate the building and call for professional

fire fighters (telephone 36111 - Emergency Report Center). All use of fire extinguishers must be reported to the Department Safety Officer.

3.5 Emergency Procedures

Medical Emergency

Minor accidents involving hazardous chemicals or the malfunction and/or breakdown of equipment must be reported to your supervisor. More serious accidents must be reported to the Head of the Department and/or the Department Safety Officer as well as to your supervisor.

All accidents involving personal injury must be reported promptly to your supervisor who is responsible for ensuring that the procedures below are followed. If your supervisor is not immediately available, contact the Department Safety Officer or the Head of the Department.

- Apply first aid (first aid kits should be available in all labs); first aid should be given by someone who has had appropriate training
- In the case of minor injuries that cannot be satisfactorily treated by first aid alone, or if there is any doubt, the injured person shall be sent or taken to the hospital emergency room, or doctor of his/her choice. Queen's employee's should take along a completed copy of the Worker's Compensation Board "Treatment Memorandum" available from the Department Administrative Assistant. If this form does not accompany the injured employee to the treatment centre then it must be filled out and sent to the treatment centre as soon as possible.
- In the case of injuries that are more severe, or there is doubt about the severity of the injury, and emergency assistance is required, call 3**6111** from an internal phone (or 911 from an external phone). A SEVERELY INJURED PERSON MUST NOT BE MOVED without the advice of medical or ambulance personnel.
- If it is necessary to call an ambulance, indicate the location of the injured person and the location of the nearest appropriate entrance to the building. If possible send someone to that entrance to lead the ambulance personnel to the injured person.

For all accidents involving critical injury or death:

- Immediately call 36111 for assistance
- As soon as possible, notify your supervisor, the Head of the Department (or Safety Officer), and the Department of Environmental Health and Safety. The latter will notify the appropriate government agencies.
- Do not touch anything associated with the accident, except for the purpose of saving life, relieving suffering or preventing unnecessary damage to equipment or property. The scene of an accident must be examined by the appropriate authorities

Fire Emergency

You must be aware of the location and/or use of all fire extinguishers, fire alarm switches and fire exits in your area. If the fire cannot safely be controlled with a fire extinguisher, then the following actions should be taken:

- alert all persons in the area of the fire emergency
- leave the area while closing doors and windows (where this can be done safely)
- activate the nearest fire alarm
- check to ensure that the area has been evacuated then leave the building to the nearest safe location
- phone the Emergency Report Centre (36111)
- be available to guide the Fire Department to the location of the fire

Chemical Spills

All spills should be cleaned up promptly, efficiently and properly. All individuals at risk due to the spill should be warned immediately.

If the spill involves nonvolatile, nonflammable and nontoxic material then it should be cleaned up as directed by your supervisor. Most cleanups of liquid spills are facilitated by the use of an absorbent material that will neutralize the liquid where appropriate (spill kits are located in the safety locker found in each research lab). Cleanup can then be carried out using a dustpan, brush and appropriate protective equipment. The spill area should be washed following the cleanup.

If a hazardous chemical such as a flammable, toxic or highly reactive substance is spilled, immediately warn everyone in the area. Shut down all equipment and leave the area. Your supervisor should be notified immediately and will be responsible for the proper cleanup of the contaminated area. Any clothing that has been contaminated should be removed as quickly as possible and decontaminated where possible. Consult the appropriate MSDS for spill clean up procedures.

Waste from chemical spills must be disposed of in an appropriate manner.

4. Waste Disposal

All chemical waste disposal is carried out by the Department of Environmental Health and Safety; sinks and garbage cans are not to be used for chemical waste disposal. All chemical waste must be segregated according to the procedures outlined in Appendix I **- Waste Chemical Disposal**. The general procedure for disposing of waste chemicals is outlined in Appendix VI - **Disposal Procedures Hazardous Chemicals**. Solid and liquid chemicals boxed for disposal are collected on Thursdays. Detailed instructions on chemical waste disposal can be found on the EH&S website: (http://www.safety.queensu.ca/chemical.htm).

Flammable liquids such as common organic solvents must be placed in solvent disposal cans (red with wide mouths and flame arrestor) which are identified as to point of origin. This waste should be collected in separate containers for **Halogenated** and **Non-halogenated** waste (<3% halogen content). **Do not fill containers to more than 90% of capacity**. Flammable liquids in solvent disposal cans are collected on Tuesdays.

Containers which have been used to store chemicals, such as stock bottles, but which are empty may be disposed of with the normal garbage; these **bottles must be washed and the labels defaced** before they are placed in the garbage.

Sharp objects such as syringe needles cannot be disposed of in conventional waste containers. They must be collected in an appropriately labeled (“SHARPS”) metal or plastic container for disposal. Separate waste containers are provided for broken glass.

Classes of Incompatible Chemicals

Class of Chemicals	Incompatible with
Alkali and alkaline earth carbides, hydrides, hydroxides, metals, oxides and peroxides	Water, acids, halogenated organic compounds, halogenating agents, oxidizing agents
Azides, inorganic	Acids, heavy metals and their salts, oxidizing agents
Cyanides, inorganic	Acids, strong bases
Nitrates, inorganic	Acids, reducing agents
Nitrites, inorganic	Acids, oxidizing agents
Organic acyl halides, anhydrides	Bases, organic hydroxy and amino compounds
Organic halogen compounds	Group IA and IIA metals, aluminum
Organic nitro compounds	Strong bases
Oxidizing agents (chlorates, chromates, chromium trioxide, dichromates, halogens, halogenating agents, hydrogen peroxide, nitric acid, nitrates, perchlorates, peroxides, permanganates, persulfates)	Reducing agents, ammonia, carbon, metals, metal hydrides, nitrites, organic compounds, phosporous, silicon, sulfur
Reducing agents	Oxidizing agents, arsenates, arsenites, phosphorous, selenites, selenates, tellurium salts and oxides
Sulfides, inorganic	Acids

Source: “Prudent Practices in the Laboratory: Handling and Disposal of Chemicals”, National Research Council, National Academy of Sciences, Washington, 1995.

CHEMICAL HAZARD RATING GUIDE

May 2004.

DEPARTMENT OF CHEMISTRY

QUEEN'S UNIVERSITY

HAZARD RATINGS	LEGEND
HEALTH	Hlth
FLAMMABILITY	Flam
REACTIVITY	React

0 = none

1 = low

2 = moderate

3 = severe

4 = extreme

WHMIS Hazard Classes

B = Flammable (F) & Combustible
C = Oxidizing Materials (O)
D1 = Immediate and Serious Toxic Effects – Poisonous (P)
D2 = Other Toxic Effects (T)
E = Corrosive Materials (C)
F = Dangerously Reactive Materials (R)

NOTE: The information contained in this booklet is provided as a preliminary guide to hazards associated with many common laboratory chemicals. It is NOT a substitute for the more detailed information found on a Material Safety Data Sheet (MSDS).

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Acacia (gum arabic)	0	0	0							
Acenaphthylene	2	1	0					T		
Acetaldehyde	2	4	1					T		
Acetamine scarlet B	1	0	0							
Acetanilide	2	1	0					T		
Acetic acid	3	2	1		F			T	C	
Acetic acid 1 M	2	1	0					T	C	
Acetic acid 2M	2	1	0					T	C	
Acetic anhydride	3	2	2		F			T	C	
Acetonaphthene	1	1	0							
Acetone	2	3	0					T		
Acetonitrile	2	3	1		F			T		
Acetophenone	1	2	0		F					
Acetyl chloride	3	2	2		F		P		C	
Acetylsalicylic acid	2	1	0				P			
Acotinic acid	2	1	0					T		
Acridine orange	1	1	0							
Acriflavin	2	1	0					T		
Acrolein	3	4	2		F		P			R
Acrylamide	3	1	0				P			
Acrylic acid	3	2	1		F		P		C	
Actinomycin D	4	1	0				P			
Adenine	1	1	0							
Adenine 5-triphosphatase	1	1	0							
Adenine hydrochloride	1	1	0							
Adenine sulphate	1	1	0							
Adenosine	1	1	0							
Adenosine 5' diphosphate	1	1	0							
Adenosine 5' monophosphoric acid	1	1	0							
Adenosine 5' triphosphate	1	1	0							
Adipic acid	1	1	0							
Alanine	1	0	0							
DL – Alanine	0	0	0							
Albumin	1	1	0							
Alcoholic sulphuric acid	3	3	0		F			T	C	
Alcojet detergent	2	0	0					T		
Alconox detergent	2	1	0							
Allantoin	1	1	0							
Allyl alcohol	2	3	0		F			T		
Alumina	0	0	0							
Aluminum ammonium sulphate	1	0	0							
Aluminum bromide	3	0	1						C	
Aluminum chloride	3	0	2						C	
Aluminum nitrate	2	0	0			O				
Aluminum oxide	0	0	0							
Aluminum potassium phosphate	1	0	0							
Aluminum potassium sulphate	1	0	0							

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Aluminum sulfate octahydrate	2	0	0					T		
Alzarine red	1	1	0							
9-Aminoacridine	2	1	0					T		
4-Aminoantipyrine	1	1	0							
para-Aminobenzoic acid	2	0	1					T		
Aminoguanidine bicarbonate	1	0	0							
Amino-N-caproic acid	1	1	0							
para-Aminohippuric acid	1	1	0							
2-Amino-2-methyl-1,3-propanediol	1	1	0							
1-Amino-2-naphthyl-4-sulfonic acid	2	1	0					T		
3-Aminophenol	2	1	0					T		
4-Aminophenol	2	1	0					T		
4-Aminopyridine	3	0	0							
Ammonia (gaseous)	3	0	0				P		C	
Ammonium acetate	2	0	0							
Ammonium bicarbonate	2	0	0					T		
Ammonium bromide	1	0	0							
Ammonium carbonate	2	0	0					T		
Ammonium chloride	1	0	0							
Ammonium dichromate	2	0	2			O	P			
Ammonium ferric citrate	1	0	0							
Ammonium ferric sulphate	1	0	0							
Ammonium ferrous sulphate	1	0	0							
Ammonium formate	2	0	0					T		
Ammonium hexafluorophosphate	3	0	0						C	
Ammonium hydrogen orthophosphate	1	0	0							
Ammonium hydroxide	3	0	0					T	C	
Ammonium hydroxide 3M	3	0	0					T	C	
Ammonium iodide, conc.	2	0	0					T		
Ammonium molybdate	2	0	0				P			
Ammonium nitrate	2	0	0			O		T		
Ammonium oxalate	3	0	0				P			
Ammonium peroxidisulfate	2	1	0			O		T		
Ammonium persulphate	3	0	1			O			C	
Ammonium phosphate monobasic	0	0	0							
Ammonium sulfate	1	0	0							
Ammonium sulfide	2	0	0					T		
Ammonium tartrate	1	1	0							
Ammonium thiocyanate	2	0	0					T		
Ampicillin	3	1	0				P			
Ampicillin sodium crystalline	3	1	0				P			
Amyl acetate	2	3	0		F			T		
Amyl alcohol	1	3	0		F					
t-Amyl Alcohol	2	3	0		F			T		
Aniline	3	2	0		F		P			
Aniline blue	1	1	0							
Aniline hydrochloride	3	1	0				P			
Animal charcoal	1	3	0		F					

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
para-Anisidine hydrochloride	3	2	0		F		P			
ortho-Anisaldehyde	1	1	0							
Anisole	2	2	0		F			T		
Anthracene	2	1	0					T		
Anthranilic acid	1	1	0							
Anthrone	1	1	0							
Antimony trichloride	3	0	1					T	C	
Antimony potassium tartrate	1	0	0							
Arginine monohydrochloride	0	0	0							
Arsenazo III sodium	3	0	0				P			
Arsenous oxide 0.1 N standard	3	0	0				P			
L-Arginine	0	1	0							
Ascorbic acid	1	1	0							
Asparagine	1	1	0							
DL-Aspartic acid	0	1	0							
Atrazine	2	0	0					T		
Atropine sulphate	2	1	0				P			
Auramine	1	0	0							
Avicel	0	1	0							
5-Azacytidine	3	1	0				P			
Azoxybenzene	2	1	0					T		
Barium acetate	1	0	0							
Barium carbonate	2	0	0					T		
Barium chloride	2	0	0				P			
Barium hydroxide	3	0	0					T	C	
Barium nitrite	2	0	1			O		T		
Barium peroxide	3	0	1			O	P			
Barium sulfate	1	0	0							
Benzaldehyde	1	2	0		F					
Benzamide	1	0	0							
Benzene	3	3	1		F			T		
Benzidine	3	1	2				P			
Benzoic acid	2	1	0					T		
Benzoin	1	1	0							
Benzonitrile	2	2	0		F			T		
Benzophenone	2	2	0		F			T		
Benzotriazole	2	1	0					T		
Benzoyl chloride	3	1	2					T	C	
Benzoyl peroxide	2	2	3		F			T		R
Benzyl acetate	2	1	0					T		
Benzyl amine	3	2	0		F		P			
Benzyl benzoate	2	2	0		F			T		
Benzyl chloride	3	2	1		F		P		C	
Berylium sulphate	3	0	0				P			
Biotin	1	0	0							
Biphenyl	2	1	0					T		
1,2-bis(2-chloroethoxy)-ethane	2	1	0					T		

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Bismuth metal	1	1	0							
Bismuth subcarbonate	1	0	0							
Boracic acid	2	0	0					T		
Borax	1	0	0							
Boric acid	2	0	0					T		
Bromine (5%) in carbon tetrachloride	3	0	0				P		C	
2-Bromoacetophenone	2	1	0					T		
Bromobenzene	2	2	0		F			T		
para-Bromobenzyl bromide	3	1	0				P			
1-Bromobutane	2	3	0		F					
2-Bromobutane	2	3	0		F			T		
Bromocresol green indicator	1	0	0							
Bromocresol purple	1	1	0							
Bromoform	3	0	0				P			
2-Bromo-2-methylpropane	2	3	0		F			T		
1-Bromonaphthalene	2	1	0					T		
Bromophenol blue	1	1	0							
para-Bromophenyl isocyanate	2	2	0		F		P			
N-Bromosuccinimide	2	1	0					T		
Bromothymol blue	1	0	0							
2,3-Butanediol	1	2	0		F					
1-Butanol	2	3	0		F					
2-Butanol	2	3	0		F			T		
t-Butanol	2	3	0		F			T		
3-Buten-2-one	4	3	2		F		P			
Butylamine	3	3	0		F		P			
para-*t*-Butylbenzoic acid	1	1	0					T		
Butyl ether	2	3	0		F			T		
Butylated hydroxytoluene	2	1	0					T		
Butyraldehyde	2	3	0		F			T		
Butyric acid	2	2	0		F			T		
γ-Butyrolactone	2	2	0		F			T		
Cacodylic acid	4	0	0				P		C	
Cadium acetate	3	0	0				P			
Cadium metal	3	0	0				P			
Cadium nitrate	3	0	1			O	P			
Cadmium chloride	3	0	0				P			
Cadmium iodide	3	0	0				P			
Cadmium sulphate	3	0	0				P			
Caffiene	1	1	0							
Calcium carbonate	1	0	0							
Calcium bicarbonate	1	0	0							
Calcium carbide	2	2	2		F			T		R
Calcium chloride	2	0	0							
Calcium hydride	3	3	1		F			T	C	

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Calcium hydroxide	3	0	0					T	C	
Calcium hypochlorite	3	0	2			O		T	C	
Calcium lactate	1	1	0							
Calcium nitrate	1	0	0			O				
Calcium oxalate	2	0	0				P			
Calcium oxide	3	0	0					T	C	
Calcium pantothenate	0	1	0							
Calcium phosphate, dibasic	1	0	0							
Calcium sulfate	1	0	0							
Calcium sulfide	2	0	1					T		
Camphor	2	1	0					T		
Capsaicin	3	0	0					T		
Captan 10 fungicide	2	0	0					T		
Carbaryl (sevin)	4	2	0		F		P			
Carbon tetrachloride	3	0	0				P			
Carbonic acid	2	0	1					T	C	
Carmine	1	0	0							
Carophylene	1	1	0							
Carotene beta	1	1	0							
Casein	0	1	0							
Casein hydrolysate	1	1	0							
Casein mannitol	0	1	0							
Castor oil	2	1	0					T		
Catechol	2	1	0				P			
Ceric ammonium nitrate	2	0	1			O		T		
Ceric sulphate	2	0	0					T		
Cesium (III) nitrate	1	0	1			O				
Cesium chloride	1	0	0							
Cesium sulphate	1	0	0							
Cetyltrimethylammonium bromide	2	0	0				P			
Charcoal	1	2	0		F					
Chloral hydrate	2	1	0				P			
α-Chloroacetophenone	2	1	0					T		
Chloramine T	2	1	0					T		
Chloramphenicol	3	1	0				P			
Chlorine gas	4	0	2			O	P		C	
Chloroacetic acid	3	1	0				P		C	
meta-Chloroaniline	2	1	0				P			
Chlorobenzene	3	2	0		F		P			
meta-Chlorobenzoic acid	2	0	0					T		
1-Chlorobutane	2	3	0		F			T		
Chloroform	3	0	0				P			
2-Chloro-2-methylpropane	2	3	0		F			T		
para-Chloronitrobenzene	2	1	0					T		
meta-Chloroperoxybenzoic acid	2	1	2			O	P			R
Chlorophenol red	1	1	0							

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Chloroplatinic acid	3	0	0				P			
Chlorosulfonic acid	3	1	0			O	P		C	
Cholecalciferol	3	1	0				P			
Cholesterol	1	1	0							
Cholic acid	2	1	0					T		
Choline chloride	1	0	0							
Chromic acid	3	0	1			O	P		C	
Chromic acid cleaning sol'n	3	0	2			O	P		C	
Chromic nitrate	3	0	1			O	P			
Chromic sulfate	3	0	0				P			
Chromium acetate	3	0	0				P			
Chromium chloride	3	0	0				P			
Chromium nitrate	3	0	1			O	P			
Chromium potassium sulphate	3	0	0							
Chromium sulphate	3	0	0				P			
Chromium trioxide	3	0	1			O	P		C	
Cinnamic acid	2	1	0					T		
Cinnamic acid sodium salt	1	1	0							
Citric acid	2	1	0					T		
Cobalt chloride	2	0	0					T		
Cobaltous acetate	2	0	0					T		
Cobaltous carbonate	2	0	0					T		
Cobaltous chloride	2	0	0					T		
Cobaltous nitrate	2	0	0			O		T		
Cobaltous sulfate	2	0	0					T		
Congo red	2	1	0				P			
Copper chloride 0.2M	1	0	0							
Copper metal turnings	1	0	0							
Copper sulfate	2	0	0					T		
Copper sulfate 0.1 M	1	0	0							
meta-Cresol	3	2	0		F		P		C	
para-Cresol	2	1	0				P			
Cresol red	1	1	0							
Crotonaldehyde	2	3	2		F		P			
Crystal violet	1	1	0							
Cupric acetate	2	0	0				P			
Cupric ammonium sulfate hydrate	1	0	0							
Cupric chloride	2	0	1				P			
Cupric hydroxide	2	0	0				P		C	
Cupric nitrate	2	0	0			O	P			
Cupric sulfate anhydrous	2	0	0				P			
Cyanuric acid	2	1	0					T		
α-Cyclodextrin	1	0	0							
β-Cyclodextrin	1	0	0							
Cyclohexane	2	3	0		F					
Cyclohexanol	2	2	0		F			T		
Cyclohexanone	2	2	0		F			T		
Cyclohexene	2	3	0		F			T		
Cycloheximide	3	1	0				P			
Cyclopentanone	2	3	0		F			T		
Cysteine hydrochloride	1	0	0							

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Decan-1-ol	1	2	0		F					
Deuterium Oxide	0	0	0							
Dexamethasone	3	1	0				P			
Dextrin	1	2	0		F					
3,3'-Diaminobenzidine	3	1	0				P			
para-Dibromobenzene	3	2	0		F		P			
1,2-Dibromoethane	3	0	0					T		
Dibutyl phthalate	1	1	0							
1,3-Dichloroacetone	4	1	0				P			
para-Dichlorobenzene	2	3	0		F		P			
1,4-Dichlorobutane	2	2	0		F			T		
1,4-Dichloro-2-butyne	3	1	0						C	
1,10-dichlorodecane	2	1	0						C	
Dichloro(diphenyl)methane	3	1	0						C	
1,2 Dichloroethane	1	3	0		F			T		
Dichloropentadiene	2	3	0		F		P			
2,4-Dichlorophenol	2	1	0					T		
1,2-Dicyanobenzene	2	1	0					T		
Diethyl aniline	2	2	0					T		
Diethyl ether	2	4	1		F			T		
Diethyl maleate	1	1	0							
Diethyl succinate	1	1	0							
Diethylamine	2	3	0		F			T		
Diethylaminoethanol .HCl	3	1	0					T	C	
Diethylene glycol	2	1	0					T		
Diisopropylamine	3	3	0		F			T	C	
1,2-Dimethoxyethane	2	3	0		F					
para-Dimethylaminobenzaldehyde	2	1	0					T		
N,N-Dimethylaniline	2	2	0		F			T		
2,3-Dimethylaniline	3	1	0					T		
Dimethyl ether	2	4	0		F			T		
Dimethyl phthalate	2	1	0					T		
2,2-Dimethyl-1,3-propanediol	2	1	0					T		
Dimethyl sulfoxide	2	2	0		F			T		
Dimethylamino-p-benzaldehyde	1	0	0							
N,N-Dimethycyclohexylamine	3	3	0		F		P			
Dimethyldichlorosilane	3	3	1		F		P			
Dimethylformamide (DMF)	2	2	0		F			T		
Dimethylglyoxime	2	0	0					T		
2,9-Dimethyl-1,10-phenanthroline	2	1	0					T		
2,4-Dimethyl-3-pentanone	2	3	0		F			T		
2,4-Dinitroaniline	2	1	3				P			R
meta-Dinitrobenzene	2	2	0				P			
3,5-Dinitrobenzoic acid	2	1	0					T		
3,5-Dinitrobenzoyl chloride	2	0	0					T		
2,4-Dinitrochlorobenzene	2	1	0				P			
2,4-Dinitrophenol	3	2	3		F		P			R

CHEMICAL HAZARD RATING GUIDE										
	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
2,4-Dinitrophenylhydrazine	2	1	3					T		R
3,5-Dinitrosalicylic acid	2	1	0					T		
1,4 Dioxane	2	3	1		F			T		
Diphenylacetic acid	2	1	0					T		
Diphenylamine	2	1	0					T		
Diphenylamine sulfonic acid Na salt	1	1	0							
Diphenylthiocarbazone	1	1	0							
2,2'-Dipyridyl	2	1	0					T		
Disodium hydrogen orthophosphate	1	0	0							
Dithiothreitol	2	1	0				P			
Divinyl benzene	2	2	2		F			T		
Dodecane	1	2	0							
Dodecyl alcohol	1	1	0							
Dry ice (solid carbon dioxide)	2	0	0				P			
Erythrosine B	2	0	0					T		
Estradiol	3	1	0				P			
Ethanethiol (Ethyl mercaptan)	2	4	0		F			T		
Ethanolamine	2	1	0					T	C	
Ether, Diethyl	2	4	1		F			T		
Ethyl alcohol 100%	2	3	0		F			T		
Ethyl alcohol 20%	1	2	0		F					
Ethyl alcohol 50%	1	2	0		F					
Ethyl alcohol 70%	2	3	0		F			T		
Ethyl alcohol 95%	2	3	0		F			T		
2-Ethoxyethanol	2	2	0		F			T		
Ethyl acetate	2	3	0		F			T		
Ethyl acetoacetate	1	2	0		F					
Ethyl benzene	2	3	0		F			T		
Ethyl formate	2	3	0		F			T		
N-Ethylmaleimide	3	1	0				P		C	
Ethyl malonate	1	2	0		F					
Ethyl phenylacetate	1	1	0							
Ethyl salicylate	1	2	0		F					
Ethylamine 70% aqueous	3	3	0		F		P		C	
Ethylamine anhydrous	3	3	0		F		P		C	
Ethylene bromide	3	0	0				P			
Ethylene carbonate	1	1	0							
Ethylene dichloride	3	3	0		F		P			
Ethylene glycol	2	1	0					T		
Ethylenediaminetetraacetic Acid EDTA	1	1	0							
Ethyl vinyl ketone	2	3	1		F					
Eugenol	2	1	0					T		

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Ferric Chloride	2	0	0					T		
Ferric Chloride 0.2M	1	0	0							
Ferric citrate	1	0	0							
Ferric Nitrate	2	0	0			O				
Ferric Oxide	1	0	0							
Ferric Sulphate	1	0	0							
Ferrous ammonium sulfate	1	0	0							
Ferrous Chloride	1	0	0							
Ferrous sulfate .7H20	1	0	0							
Ferrous sulphate	1	0	0							
Fluorenone	1	1	0							
Fluorescein disodium	1	1	0							
Fluorouracil	2	0	0					T		
Folic acid	1	1	0							
Formaldehyde	3	3	0		F		P			
Formalin 10%	2	1	0				P			
Formamide	2	1	0					T		
Formic acid	3	2	1		F		P		C	
Formic acid 60 percent in water	3	1	1				P		C	
Fructose	1	1	0							
Fuchsin, Acid	1	1	0							
Fuchsin, basic	2	0	0					T		
Fumaric acid	2	1	0					T		
Galactose	0	1	0							
Gallic acid	2	1	0					T		
Gelatin USP	0	1	0							
Gentian violet	2	1	0				P			
Germanium tetrachloride	3	0	1				P			
D-Glucose	0	1	0							
Glutamic acid	1	1	0							
Glutamine	1	1	0							
Glutaraldehyde	2	0	0				P			
Glutaric acid	1	0	0							
Glycerol	1	1	0							
Glycerol monostearate	1	1	0							
Glycine	0	0	0							
Glyoxal 40% solution	2	0	0					T		
Gold Chloride	2	0	0					T		
Graphite	1	0	0							
Guaiacol	2	2	0		F			T		
Guanidine	0	1	0							
Guanidine Hydrochloride	0	1	0							
Guanidine Isothiocyanate	2	1	0					T		
Guanosine	0	1	0							

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
N-Heptane	1	3	0		F					
Heptanol	2	2	0		F			T		
Hexadecane	0	1	0							
Hexadecyltrimethylammonium Bromide	1	0	0							
1,6-Hexanediamine	2	2	0		F			T		
Hexanes	2	3	0		F			T		
2-Hexanone	2	3	0		F			T		
1-Hexyne	2	3	0		F			T		
L-Histidine mono hydrochloride	1	0	0							
Hydrazine hydrate	3	2	0		F		P			
Hydrobromic acid	3	0	1					T	C	
Hydrochloric acid	3	0	1					T	C	
Hydrochloric acid 1 N	2	0	0						C	
Hydrochloric acid 2N	3	0	0					T	C	
Hydrochloric acid 6N	3	0	0					T	C	
Hydrocinnamaldehyde	2	1	0					T		
Hydrogen peroxide 3%	2	0	0			O				
Hydrogen peroxide 35%	2	0	1			O	P			
Hydroquinone	2	1	0					T		
2-Hydroxyethyl methacrylate	3	1	0				P			
Hydroxylamine hydrochloride	2	1	0				P			
8-Hydroxyquinoline	2	1	0					T		
Hypophosphorous acid 50%	3	0	0					T	C	
Imidazole	2	1	0					T		
Indigo	0	0	0							
Indigo carmine	1	1	0							
Indium metal	2	0	0					T		
Indium oxide	2	0	0					T		
Indoleacetic acid	2	1	0					T		
Indolebutyric acid	2	1	0					T		
Inositol	0	1	0							
Iodic acid	2	1	0					T	C	
Iodine	2	0	1					T		
Iodine/potassium iodide	2	0	0			O				
2-Iodobenzoic acid	2	1	0					T		
Iron AA STD	1	0	0							
Isoamyl alcohol	2	2	0		F			T		
Isobutraldehyde	2	3	0		F			T		
Iso-octane	1	3	0		F					
Isophorone	2	2	0					T		
Isoprene	2	4	2		F			T		R
Isopropyl alcohol	2	3	0		F			T		
Isovaleric acid	1	1	0							

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Kieselguhr (diatomaceous earth)	1	0	0							
Kovac's reagent	3	2	0		F		P			
L-[+]-Lactic acid 30 W/W sol'n	2	0	0					T		
Lactic acid	2	1	0					T		
D-(-)-Lactic acid	3	1	0					T		
Lactose	1	1	0							
Lanthanum acetate	1	0	0							
Lanthanum chloride	1	0	0							
Lauric acid	1	1	0							
Lauryl alcohol	1	1	0							
N-Lauryl sarcosine, sodium salt	1	0	0							
Lead acetate	3	0	0				P			
Lead acetate 4% sol'n	3	0	0				P			
Lead citrate	3	0	0				P			
Lead metal	3	0	0				P			
Lead nitrate	3	0	0			O	P			
Lead subacetate	3	0	0				P			
Lecithin	1	1	0							
Leucine	0	1	0							
Limonene	2	3	0		F			T		
Liquid paraffin	1	1	0							
Lithium aluminum hydride	3	0	2				P		C	R
Lithium bromide	2	0	0					T		
Lithium carbonate	2	0	0					T		
Lithium chloride	2	0	0					T		
Lithium hydride	3	0	2					T		R
Lithium hydroxide	3	0	1					T	C	
Lithium lauryl sulphate	2	0	0					T		
Lithium metal	3	2	2		F			T		R
Litmus	1	0	0							
Lucas reagent	3	0	1					T	C	
Lugols iodine	2	0	0					T		
Lugols iodine, gram's modification	2	0	0					T		
2,6-Lutidine	3	3	0		F		P			
L-(+)-Lysine dihydrochloride	0	0	0							
DL-Lysine	0	0	0							
L-Lysine monohydrochloride	0	1	0							
Lysol	2	3	0		F			T		

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Magnesium acetate	1	0	0							
Magnesium carbonate	1	0	0							
Magnesium chloride	1	1	0							
Magnesium oxide	1	0	0							
Magnesium sulfate.7H20	1	0	0							
Magnesium sulfate	1	0	0							
Magnesium turnings	2	2	0		F			T		
Malachite green	1	0	0							
Maleic acid	1	0	0							
Maleic anhydride	3	1	0				P		C	
Malic Acid	1	1	0							
Malonic acid	1	1	0							
Maltose	1	1	0							
Manganese acetate	2	0	0					T		
Manganese chelate	2	0	0					T		
Manganese chloride	2	0	0					T		
Manganese dioxide	2	0	0				P			
Manganese metal	2	2	0		F		P			
Manganese sulphate	2	0	0					T		
Mannitol	0	1	0							
Menthol	1	1	0							
DL-Menthol	1	1	0							
Mercaptoethanol	2	2	0		F		P	T		
Mercuric chloride	3	0	0				P			
Mercuric chloride 0.1% aqueous	3	0	0				P			
Mercuric oxide	3	0	0				P			
Mercuric sulfate	3	0	0				P			
Mercurous chloride	3	0	0				P			
Mercury	3	0	0				P			
Mercury nitrate	3	0	0			O	P			
Mesityl oxide	2	3	0		F			T		
Mesitylene	2	2	0		F			T		
Methane	1	4	0		F					
Methanol	2	3	0		F			T		
DL-Methione	0	1	0							
2-Methoxyethanol	2	2	0		F		P			
β-Methoxyproprionitrile	1	2	0		F					
Para-(Methylamino) phenol	2	1	0					T		
N-Methylaniline	3	1	0					T		
Methyl Benzoate	2	2	0		F			T		
2-Methylbutyric acid	2	2	0		F			T		
Methyl cellosolve	1	2	0		F					
Methyl cellulose	1	1	0							
2-Methyl-1,3-cyclohexanedione	1	0	0							

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Methyl green	1	0	0							
Methyl malonic acid	2	1	0					T		
Methyl methacrylate	2	3	2		F			T		
N-Methylmorpholine	3	3	0		F			T	C	
2-Methylnaphthalene	2	1	0					T		
Methyl orange	2	0	0				P			
2-Methyl-2,4-pentanediol	1	1	0							
4-Methyl-2-pentanol	1	2	0		F					
2-Methyl-2-propanol	1	3	0		F					
Methyl para-toluenesulfonate	2	1	0					T		
Methyl red	1	1	0							
Methyl salicylate	2	1	0					T		
Methyl vinyl ketone	4	3	2		F		P	T		
Methyl violet	2	0	0				P			
Methyl violet 6B (Rosaniline)	1	0	0							
Methylamine hydrochloride	1	1	0							
Methylcyclohexane	2	3	0		F			T		
N,N-Methylene bisacrylamide	2	1	0					T		
Methylene blue	2	0	0					T		
Methylene chloride	2	1	0					T		
Methyl methacrylate	2	3	2		F			T		
Mineral oil	1	1	0							
Mitomycin C	3	1	0				P			
Molecular sieves type 4A	1	0	0							
Molybdate/sulfuric acid reagent	3	0	1				P		C	
Molybdenum metal	2	0	0				P			
Molybdic acid	2	0	0				P		C	
Morpholine	3	2	0		F			T	C	
Naphthalene	2	2	0		F		P			
1-Naphthol	1	1	0							
2-Naphthol	1	1	0							
1,2-Naphthoquinone	1	1	0							
1-Naphthyl acetate	2	1	0					T		
α-Naphthalenesulfonyl chloride	3	1	0					T	C	
Niacinimide (Nicotinic acid)	0	1	0							
Nickel aluminum alloy	1	0	0							
Nickel chloride	2	0	0				P			
Nickel nitrate	2	0	0			O		T		
Nickel sulfate	2	0	0					T		
Nicotinic acid	0	1	0							
β-Nicotinamide	1	0	0							
Ninhydrin	2	0	0				P			
Nitric acid	3	0	1			O	P		C	
Nitric acid 0.01 M	1	0	0			O		T		
Nitric acid 1 M	2	0	0			O		T		
Nitric acid 3M	3	0	0			O		T	C	
Nitric acid 6M	3	0	0			O		T	C	
Nitric acid 8M	3	0	1			O		T	C	
Nitric acid fuming	3	0	2			O	P		C	

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
meta-Nitroaniline	3	1	0				P			
para-Nitrobenzaldehyde	2	1	0					T		
Nitrobenzene	3	2	0		F		P			
meta-Nitrobenzenesulfonyl chloride	3	1	1				P			
para-Nitrobenzoic acid	2	1	0					T		
para-Nitrobenzyl chyloride	3	1	1					T	C	
Nitrogen (gaseous)	1	0	0							
meta-Nitrophenol	2	1	2				P			R
para-Nitrophenol	2	1	0				P			
Nitromethane	2	3	0		F			T		
para-Nitrophenyl hydrazine	2	1	0				P			
para-Nitrophenylisocyanate	2	2	0		F			T		
3-Nitrophthalic Anhydride	2	1	0					T		
Octadecyl alcohol	1	1	0							
Octane	2	3	0		F					
2-Octanol	1	2	0		F					
2-Octanone	1	2	0							
Oleic acid	1	1	0							
Orthophosphoric acid	3	0	0						C	
Osmic acid	4	0	1			O	P		C	
Osmium tetroxide	4	0	1			O	P		C	
Oxalacetic acid	2	1	0					T		
Oxalic acid	3	1	0				P		C	
Palladium chloride	2	0	0					T		
Palmitic acid	1	1	0							
DL-Pantothenic acid	0	0	0							
Papain	2	1	0					T		
Papaverine hydrochloride	2	1	0				P			
Paraffin oil	1	1	0							
Paraffin wax	0	0	0							
Paraformaldehyde	3	2	0		F		P			
Penicillin G potassium	3	1	0				P			
Pentadecane	1	1	0							
Pentane	2	4	0		F					
2,4-Pentanedione	2	3	0		F			T		
2-Pentanone	2	3	0					T		
3-Pentanone	1	3	1		F					
Pentene	2	4	0		F			T		
Peptone	1	0	0							
Perchloric acid 0.1 M in water	3	0	0					T	C	
Perchloric acid 0.1 N in acetic acid	3	2	0		F	O			C	
Perchloric acid 60%	3	0	2			O	P		C	
Periodic acid reagent	2	0	0					T		
Peroxidase	2	1	0					T		
Petroleum ether	2	3	0		F			T		
Petroleum jelly	0	1	0							

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
1,10-Phenanthroline	1	1	0							
Phenol	3	2	0		F		P		C	
Phenol red	1	1	0							
Phenol/sodium hydroxide sol'n	3	0	0				P		C	
Phenolphthalein	1	1	0							
Phenoxyacetic acid	2	1	0					T		
(S)-Phenylalanine	1	1	1							
Phenyl ether	1	1	0							
Phenyl hydrazine	2	2	2		F			T		
Phenyl isocyanate	2	2	1		F			T		
Phenyl isothiocyanate	2	2	0		F			T		
3-Phenylpropionic acid	2	1	0					T		
1-Phenylsemicarbazide	2	1	0					T		
Phenyl-2-thiourea	1	0	0							
Phenylene-o-diamine	2	1	0					T		
Phloroglucinol	2	1	0					T		
Phosgene 12% in benzene	3	3	0		F		P			
Phosphomolybdic acid	3	0	0						C	
Phosphoric acid	3	0	0						C	
Phosphoric acid 1 N	2	0	0						C	
Phosphoryl chloride	2	1	1				P			
Phosphotungstic acid	2	0	0					T		
Phthalic acid	2	1	0					T		
Phthalic anhydride	2	1	0						C	
Pinene	2	3	0		F			T		
Piperazine	2	2	0		F			T		
Piperidine	2	3	0		F		P			
Polyethylene glycol	1	0	0							
Potassium acetate	1	0	0							
Potassium ammonium phosphate	1	0	0							
Potassium bicarbonate	1	0	0							
Potassium bifluoride	3	0	0					T	C	
Potassium bisulfate	2	0	0					T		
Potassium bromide	1	0	0							
Potassium carbonate	1	0	0							
Potassium chlorate	2	0	0			O		T		
Potassium chloride	1	0	0							
Potassium chromate	3	0	0			O	P			
Potassium chromate 0.1 M	2	0	0					T		
Potassium citrate	1	0	0							
Potassium cyanide	3	0	0				P		C	
Potassium dichromate	3	0	1			O	P			
Potassium dihydroqen orthophosphate	1	0	0							
Potassium ferricyanide	2	0	0					T		
Potassium fluoride	2	0	0				P			
Potassium fluoride 2M	2	0	0				P			
Potassium hexafluorophosphate	2	0	0					T		
Potassium hydrogen phthalate	2	0	0					T		

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Potassium hydroxide	3	0	1				P		C	
Potassium hydroxide 0.1 M	1	0	0							
Potassium hydroxide 0.5N	2	0	0					T	C	
Potassium hydroxide 10% in ethanol	3	3	0		F		P		C	
Potassium hydroxide 1 N	2	0	0						C	
Potassium hydroxide saturated	3	0	1				P		C	
Potassium iodate	2	0	0			O		T		
Potassium iodide	1	0	0							
Potassium iodide 0.1 M	1	0	0							
Potassium iodide 10%	1	0	0							
Potassium metabisulfite	2	0	0					T		
Potassium nitrate	2	0	0			O		T		
Potassium oxalate	3	0	0				P			
Potassium perchlorate	2	0	1			O		T		
Potassium periodate	1	0	0			O				
Potassium permanganate	2	0	0			O				
Potassium persulfate	2	0	2			O				
Potassium phosphate	1	0	0							
Potassium sodium tartarate	1	1	0							
Potassium sulfate	1	0	0							
Potassium sulphite	2	0	0					T		
Potassium tartrate	1	0	0							
Potassium tellurite	2	0	0					T		
Potassium thiocyanate	2	0	0					T		
Potassium triiodide sol'n	2	0	0					T		
para-Phenylenediamine	3	1	0				P			
L-Proline	1	1	0							
1-Propanol (n-Propanol)	1	3	0		F					
2-Propanol (iso-Propanol)	2	3	0		F			T		
Propane-1,2-diol	2	1	0					T		
Propargyl alcohol	3	3	0		F		P			
Propionaldehyde	2	3	1		F			T		
Propiophenone	1	2	0		F					
Propionic acid	3	2	0		F			T		
N-Propylacetate	1	3	0		F					
Propylamine	3	3	0		F			T		
Propylene glcol	1	1	0							
Propylene oxide	2	4	1		F			T		
Pump oil	1	1	0							
Purine	2	1	0					T		
Putrescine	3	0	0					T		
Propylene glycol	1	1	0							
Pyridine	2	3	0		F			T		
Pyridinium bromide perbromide	3	1	0				P			
Pyridoxine	0	0	0							
Pyridoxine hydrochloride	2	1	0					T		
Pyrogallol	2	1	0					T		

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Quinine sulphate	2	1	0				P			
Quinoline	2	1	0				P			
8-Quinolinol	3	1	0				P			
Resorcinol	2	1	0				P			
Rhamnose	1	0	0							
Rhodium chloride	1	0	0							
Rhodium sponge	2	0	1					T		
Riboflavin	1	1	0							
Ribonucleic acid	1	0	0							
para-Rosaniline	3	1	0				P			
Rubbing alcohol	2	3	0		F			T		
Rubidium chloride	2	0	0					T		
Ruthenium chloride	2	0	0					T		
Salicylamide	1	0	0							
Salicylic acid	1	1	0							
Scintillation fluid	2	3	0					T		
Selenous acid	3	0	1					T	C	
Semicarbazide hydrochloride	2	0	0					T		
L-Serine	0	1	0							
Silica gel	1	0	0							
Silicic acid	2	0	0					T		
Silver	2	0	0							
Silver acetate	2	0	0							
Silver chloride	2	0	0							
Silver nitrate	3	0	3			O	P		C	
Silver nitrate 0.05M	2	0	0					T		
Silver nitrate 0.2M	2	0	0				P			
Silver oxide	2	0	0							
Silver sulphate	2	0	0							
Soda lime 6-12 mesh	3	0	0						C	
Sodium acetate	1	0	0							
Sodium acid phosphate	1	0	0							
Sodium arsenate	3	0	0				P			
Sodium arsenite	3	0	0				P			
Sodium azide	3	0	2				P			R
Sodium benzoate	1	1	0							
Sodium bicarbonate	1	0	0							
Sodium bismuthate	1	0	0							
Sodium bisulfate	2	0	0					T	C	
Sodium bisulfite sat.	2	0	0					T		
Sodium borate	2	0	0					T		
Sodium borohydride	2	0	2				P			R
Sodium bromide	1	0	0							
Sodium carbonate [ANH]	2	0	1						C	
Sodium carbonate.10H20	2	0	1						C	
Sodium chlorate	2	0	0			O		T		
Sodium chloride	1	0	0							
Sodium chromate	3	0	0			O	P			
Sodium citrate	1	0	0							
Sodium cobalt nitrite	2	0	0			O		T		
Sodium dichromate	2	0	0			O	P			

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CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Sodium diethyldithiocarbamate	2	1	0					T		
Sodium dihydrogen orthophosphate	1	0	0							
Sodium dithionite	2	2	1		F			T		
Sodium dodecyl sulphate	1	0	0							
Sodium fluoride	3	0	0				P			
Sodium formate	2	0	0					T		
Sodium hippurate	1	0	0							
Sodium hydride in oil	3	0	2					T	C	R
Sodium hydrogen chromate	2	0	0			O		T		
Sodium hydrosulphite	2	0	2					T		R
Sodium hydroxide	3	0	1					T	C	
Sodium hydroxide 0.1 N	1	0	0							
Sodium hydroxide 1N	2	0	0					T		
Sodium hydroxide 2N	3	0	0					T	C	
Sodium hydroxide 6N	3	0	0					T	C	
Sodium iodate	2	0	1			O		T		
Sodium iodide	1	0	0							
Sodium metabisulfite	2	0	0			O	P			
Sodium metal	3	3	3		F				C	R
Sodium metaphosphate	1	0	0							
Sodium methoxide	3	3	2		F			T	C	
Sodium molybdate	2	0	0					T		
Sodium nitrate	1	0	3			O		T		
Sodium nitrite	2	0	2			O	P			
Sodium nitroprusside	3	0	0				P			
Sodium oleate	1	0	0							
Sodium oxalate	3	0	0				P			
Sodium perborate	2	0	1			O				
Sodium perchlorate	2	0	1			O	P			
Sodium periodate	2	0	0			O				
Sodium phosphate, dibasic	1	0	0							
Sodium phosphate, monobasic	1	0	0							
Sodium phosphate, tribasic	1	0	0							
Sodium potassium tartrate	1	0	0							
Sodium pyrophosphate	1	0	0							
Sodium pyruvate	1	0	0							
Sodium selenite	4	0	0				P			
Sodium sulfate anhydrous	1	0	0							
Sodium sulfate.10H20	1	0	0							
Sodium sulfite	2	0	0				P			
Sodium tartrate	0	0	0							
Sodium tetraphenylboron	2	1	0					T		
Sodium thiocyanate	2	0	0					T		
Sodium thiogycollate	2	0	0					T		
Sodium thiosulfate	1	0	0							
Sorbitol	0	1	0							
Spermidine	2	0	0					T		
Spermine	2	0	0					T		
Stannic chloride	2	0	0					T		
Stannic oxide	2	0	0					T		

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	Hazard Rating				WHMIS Hazard Class					
CHEMICAL NAME	**HLTH**	**FLAM**	**REACT**		**B**	**C**	**D1**	**D2**	**E**	**F**
Stannous chloride	2	0	0					T		
Stannous sulphate	2	0	0					T		
Starch	0	0	0							
Stearic acid	1	1	0							
Streptomycin sulphate	3	1	0				P			
trans-Stilbene	1	1	0							
Strontium acetate	2	0	0					T		
Strontium carbonate	2	0	0					T		
Strontium chloride	2	0	0					T		
Succinic acid	2	1	0							
Sucrose	0	1	0							
Sudan 111	2	1	0					T		
Sudan IV	2	1	0					T		
Sulfamic acid 0.85M	2	0	0					T	C	
Sulfanilic acid	1	0	0							
Sulfur	1	1	0							
Sulfolane	1	1	0							
Sulfurous acid	3	0	1			O	P		C	
Sulfuryl chloride in carbon tet	3	0	1			O	P		C	
5-Sulphosalicylic acid	1	1	0							
Sulphur hexafluoride	2	0	0					T		
Sulphuric acid 0.01 M	1	0	0							
Sulphuric acid 0.5M	2	0	0						C	
Sulphuric acid 1 M	2	0	0					T	C	
Sulphuric acid 3M	3	0	0				P		C	
Sulphuric acid 6M	3	0	0				P		C	
Sulphuric acid	3	0	2			O	P		C	
Sulfuric acid:nitric acid (75:1)	3	0	2			O	P		C	
Talcum powder	1	0	0							
Tannic acid	1	1	0							
Tartaric acid-D-(+)	1	1	0							
para-Terphenyl	2	0	0				P			
α-Terpineol	2	2	0		F			T		
Tetraamine copper	2	0	0					T		
Tetrachlorethylene	2	0	0					T		
Tetracycline	2	0	0					T		
Tetradecane	1	1	0							
Tetradecyltrimethylammonium Br	2	0	0					T		
Tetramethylenediamine TMEDA	2	3	0		F			T		
Tetramethylsilane	2	4	0		F			T		
Thiamine (aneurine hydrochoride)	1	0	0							
Thiamine hydrochloride	1	0	0							
2-Thiobarbituric acid	2	1	0					T		
Thiogycollic acid	2	1	1					T		
Thionyl chloride	3	0	0				P		C	
Thiourea	2	1	0					T		

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L-Threonine	0	0	0							
Thymidine	0	0	0							
Thymol blue indicator in ethanol	2	3	0		F			T		
Tin granular	0	0	0							
Toluene	2	3	0		F			T		
para-Toluenesulfonyl chloride	2	1	1					T		
para-Toluenesulfonic acid	2	1	0					T	C	
para-Toluidine	3	2	0		F		P			
para-Tolylisocyanate	2	2	0		F		P			
2,2,2-Tribromoethanol	2	1	0					T		
Tributylamine	3	2	0		F				C	
Trichloroacetic acid	3	0	0				P		C	
1,2,3-Trichloropropane	2	2	0					T		
Tridecane	1	2	0							
Triethanolamine	2	1	0					T		
Triethylamine	2	3	0		F		P			
Triethylene glycol	2	1	0					T		
Triethylene tetraamine	3	1	0					T	C	
Trimethoxyborane	2	3	1		F			T		
1,3,5-Trinitrobenzene	2	4	4		F			T		R
Triphenylmethane	1	1	0							
Triphenylphosphine	2	1	2					T		
Triton X-100	1	0	0							
L-Tryptophan	1	0	0							
Tungstic acid	2	0	0					T	C	
Undecane	1	2	0							
Uranyl acetate	2	0	0				P			
Urea	1	1	0							
Valeraldehyde	2	3	0		F			T		
Valeric acid	2	1	0						C	
DL-Valine	0	1	0							
Vanillin	1	1	0							
Varsol	2	2	0		F			T		
Vinyl acetate	2	3	0		F			T		
Vitamin B12	1	1	0							
Vitamin D3	1	1	0							
Vitamin E acetate	1	1	0							
Vitamin A palmitate	1	1	0							
Xylenes	2	3	0		F			T		
Zinc chloride	2	0	0				P			
Zinc dust	2	2	0		F			T		
Zinc metal	1	1	0							
Zinc nitrate	2	0	0			O		T		
Zinc sulfate	2	0	0					T		
Zirconium tetrachloride	2	0	0					T		