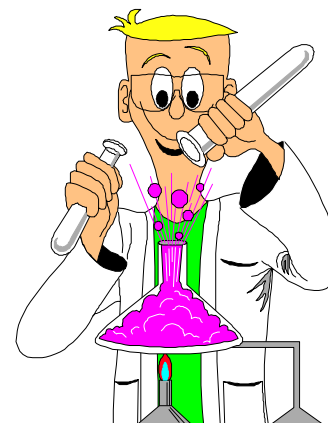


FACULTY OF SCIENCE GUIDELINES FOR HEALTH & SAFETY

LABORATORY CHEMICALS



Version 1, November 1997

SCOPE OF GUIDELINES

These guidelines apply to all laboratories in the Faculty of Science that use, handle, store or dispose of chemicals.

WHO SHOULD USE THE GUIDELINES

- Supervisors of laboratories that use, handle, store or dispose of chemicals
- Resource Managers in departments that use, handle, store or dispose of chemicals
- Technical staff in laboratories that use, handle, store or dispose of chemicals
- Technical staff working in chemical stores
- Postgraduate students working with chemicals

PURPOSE OF GUIDELINES

- To ensure that staff and students working in laboratories in the Faculty of Science are aware of their responsibilities with regard to the storage and labelling of laboratory chemicals;
- To ensure that consistently high health and safety standards are achieved in laboratories that use, handle, store or dispose of chemicals in the Faculty of Science;

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I. INTRODUCTION

To ensure the health and safety of those using chemicals in laboratories, it is essential that **all** aspects of the nature of the substances in use be considered. The effects of chemicals may arise from:

- the **physical and chemical properties** of the substance, and/or
- the **toxicity** of the substance, ie whether the substance is a **poison**, a **carcinogen** or **hazardous to health** in other ways.

These aspects of chemical safety are controlled in Victoria by a number of regulations and standards that are outlined below:

- **Physical and chemical properties of the substance**

Dangerous Goods (Storage & Handling) Regulations 1989

- **Poisons**

Drugs, Poisons and Controlled Substances Regulations 1995

Standard for the Uniform Scheduling of Drugs & Poisons

- **Carcinogens**

**National Model Regulations for the Control of Workplace Hazardous Substances 1993*

Drugs, Poisons and Controlled Substances Regulations 1995

- **Substances Hazardous to health**

**National Model Regulations for the Control of Workplace Hazardous Substances 1993*

Lead Regulations

Asbestos Regulations

**NB Not yet in force in Victoria*

Some of the overlap that occurs in these regulations will be removed when the Victorian Hazardous Substances regulations are introduced in 1998. However, it should be noted that a degree of overlap is still likely to occur, as some chemicals will always be classified as both 'dangerous' and 'toxic'.

The labelling, storage, use and disposal of chemicals, drugs and poisons will be described in this section according to the requirements of these regulations. Each of the regulations is further described in the next section 'Overview of terms used, regulations and codes'.

II. OVERVIEW OF TERMS USED, REGULATIONS AND CODES

A. Dangerous Goods

1. Dangerous goods are substances and articles that are potentially dangerous to people and property. They may be corrosive, flammable, explosive, spontaneously combustible, poisonous, oxidising or water-reactive.
2. From a regulatory viewpoint, dangerous goods are substances that are specifically listed in, or which meet the classification criteria of being dangerous under the Dangerous Goods Act.
3. Dangerous goods are **not** necessarily hazardous substances. These are totally separate classifications. For instance, sodium hydroxide (caustic soda) is both a dangerous good and a hazardous substance due to its corrosive and irritant properties. A compressed inert gas such as helium is a dangerous good as it may explode, but it is not a hazardous substance as it has low chemical toxicity.
4. Dangerous goods are **classified** according to the predominant type of risk involved:

Class 1 Explosives

(Separately regulated under the Dangerous Goods (Explosives) Regulations 1988)

Class 2 Gases - compressed, liquefied or dissolved under pressure

Class 2.1 Flammable gases

Class 2.2 Non-flammable gases

Class 2.3 Poisonous gases

Class 3 Flammable liquids

Flammable liquids with flashpoint $\leq 61^{\circ}\text{C}$

Class 4. Flammable solids or substances

Class 4.1 Flammable solids

Class 4.2 Substances liable to spontaneous combustion

Class 4.3 Substances emitting flammable gases when wet

Class 5 Oxidising substances

Class 5.1 Oxidising agents

Class 5.2 Organic Peroxides

Class 6. Poisonous (toxic) and infectious substances

Class 6.1 (a) Poisonous (toxic) substances

Class 6.1(b) Harmful (toxic) substances

Class 6.2 Infectious substances (Separately regulated under the Health Act 1958)

Class 7. Radioactive substances

(Separately regulated under Health (Radiation Safety) Regulations 1994)

Class 8. Corrosive

Class 9. Miscellaneous dangerous substances

Classes 3, 4, 5, 6 and 8 are divided into packaging groups that indicate the degree of danger or risk of the substance and therefore how much of the substance can be safely transported.

<u>Packaging Group</u>	<u>Danger</u>
I	Highest degree of hazard
II	Intermediate degree of hazard
III	Lowest degree of hazard

B. Hazardous Substances

1. A hazardous substance is a substance that has the potential to harm the health or safety of people in the workplace.
Although many substances may present hazards at work, the substances can be used safely provided that the hazards are known and understood and appropriate precautions are taken.
2. In the National Model Regulations for the Control of Workplace Hazardous Substances (1993), a hazardous substance means a substance which:
 - is listed on the National Occupational Health and Safety Commission's *List of designated hazardous substances*, or
 - has been classified as a hazardous substance by the manufacturer or importer, in accordance with the National Occupational Health and Safety Commission's *Approved criteria for classifying hazardous substances*.
3. The National Model Regulations for the Control of Workplace Hazardous Substances and the National Code of Practice for the Control of Workplace Hazardous Substances are guidance documents for the management of hazardous substances in the workplace. Hazardous substances legislation is expected to be gazetted in Victoria in 1998. Radioactive and infectious substances are exempt from these national model regulations as they are separately controlled.
4. To be classified as a hazardous substance, the ingredients of the substance must be present in concentrations that are known to cause health effects. Where this is the case the substance must be:
 - labelled appropriately to ensure that users know it is hazardous;
 - accompanied by a Material Safety Data Sheet (MSDS) setting out the health effects, instructions for safe use and storage and what to do in an emergency.

III. RESPONSIBILITIES WITH REGARD TO HAZARDOUS SUBSTANCES

NB. These responsibilities may be modified when hazardous substances legislation is introduced into Victoria.

A. Employers must:

- . identify all hazardous substances in the workplace;
- . either removal or render safe any identified workplace hazard;
- . warn all employees of any workplace hazard and train them in safe work practices to minimise risk;
- . provide workplace monitoring if the risk of airborne contamination is high;
- . establish a health surveillance program if it is deemed necessary;
- . ensure that correct labelling (according to the code of practice) of substances used in the workplace is enforced;
- . make material safety data sheets (MSDSs) available for all hazardous substances used in the workplace;
- . provide a chemical register of all hazardous substances used in the workplace;
- . develop any emergency procedures required as part of risk management for hazardous substances.

B. Chemical suppliers must:

- . evaluate the hazardous properties of any substance which they manufacture or import and produce an MSDS disclosing all ingredients and properties of the substance;
- . provide MSDSs to the employer (either with the first shipment of the designated hazardous substance or upon request);
- . correctly label hazardous substances which they supply to others.

C. Employees must:

- . cooperate with the employer with regard to hazard identification, induction and training;
- . wear and take care of personal protective equipment where required;
- . cooperate in health monitoring and surveillance programs.

IV. LABELLING OF CHEMICALS

NB. These requirements may be modified when hazardous substances legislation is introduced in Victoria.

A. General guidelines (for all substances whether classified as hazardous or not)

1. All information on labels should be:
 - on an outside face of the container;
 - in the English language;
 - in durable print;
 - in easily readable lettering.
2. The label should be firmly secured and in a colour(s) to provide a distinct contrast to the background colour.
3. Containers should remain correctly labelled until cleaned and free of the substance that they contained.

B. Labelling of non-hazardous substances

1. All substances used at work should be labelled appropriately.
2. Non-hazardous substances should be easily distinguishable from hazardous substances.
3. Information required on labels of non-hazardous substances:
 - chemical/product name;
 - name of manufacturer/supplier;
4. Useful information which can be included on labels:
 - Specific directions for use;
 - Expiry date, if appropriate.

C. Labelling of hazardous substances

The requirements of labelling of hazardous substances are determined by the size of the container as outlined in the table below.

NB. A substance, initially classified as hazardous may become non-hazardous on dilution and, thus, have different labelling requirements.

Label	Container size			
	larger than 500 ml or 500 g	smaller than 500 ml or 500g	very small*	decanted and stored
Product name	✓	✓	✓	✓
Chemical name	✓	✓	-	-
UN number	✓	-	-	-
Ingredients or formulation	✓	-	-	-
Dangerous goods information	✓	✓	✓	✓
Subsidiary risk label	✓	✓	✓	✓
Signal words	✓	✓	✓	✓
Risk phrases	✓	✓ (significant)	-	✓
Safety phrases	✓	✓ (significant)	-	✓
Directions for use	✓	-	-	-
First aid procedures	✓	✓	-	-
Emergency procedures	✓	-	-	-
Manufacturer's details	✓	✓	✓	-
Reference to MSDS	✓	✓	-	-

* Insufficient space for legible labelling

NOTES ON TABLE CONTENTS:

1. Product name

Name by which the substance is known. May be identical to chemical name.

2. Chemical name

Use (in following order of preference):

- the correct shipping name as listed in the ADG Code (if the substance is listed in the code), or
- the name as used in the Standard for the Uniform Scheduling of Drugs and Poisons, or
- the recognised chemical name, or

3. Ingredients and formulation details:
 - . hazardous ingredients in a mixture must be disclosed;
 - . list the proportion of each hazardous ingredient in a mixture, eg 10 %;
 - . if the exact amount of a hazardous ingredient is commercially confidential, then list the range of the proportion, eg > 60 %;
 - . list ingredients in descending order of proportion in the mixture.
4. Signal Words

Labels that indicate the type and severity of a hazard, eg

 - . Warning
 - . Poison
 - . Hazardous
5. Risk Phrases

A general description of the hazard to supplement the dangerous goods class and subsidiary risk label, eg

 - . Flammable
 - . Harmful if swallowed
 - . Toxic by inhalation
 - . Irritating to skin
6. Safety Phrases

Labels that provide information on safe storage, handling and personal protection, eg

 - . Avoid contact with eyes
 - . Use only in well ventilated areas
 - . Wear suitable protective clothing (specify)
 - . Keep container dry
7. First aid procedures

First aid instructions, based on methods and materials commonly available, eg

 - . Wash exposed skin with plenty of warm water
 - . Transfer patient to fresh air
 - . Remove contaminated clothing
8. Emergency procedure

Simple, brief instructions on control of leaks, spills or fire.
9. Reference to MSDS

'Additional information is listed in the Material Safety Data Sheet'

D. Labelling of decanted substances

1. Unless used immediately, substances decanted in a laboratory must be labelled according to the guidelines listed above.
2. If a substance is decanted into test tubes or columns in the laboratory, the tube, column, equipment or test tube rack may be identified with a unique identifier, eg number and the details of the substance be recorded in a book in the laboratory.

E. Containers found without correct labelling

1. A container found without a label containing an unknown product should be stored in isolation until the contents are identified and the container is appropriately labelled.
2. If the contents of a container cannot be identified, notify the Safety Officer in your department to arrange disposal.

V. STORAGE OF CHEMICALS

NB. These requirements may be modified when hazardous substances legislation is introduced in Victoria.

A. Chemical register

1. Chemical registers are required in all laboratories where hazardous substances are used and kept.
2. The register should comprise:
 - the product name;
 - the chemical name (if different from the product name);
 - the manufacturer's/supplier's name;
 - whether the chemical has been classified as hazardous by the supplier **and** the nature of the hazard associated with the product;
 - the UN number, the Dangerous goods class, if available;
 - the location; and
 - the maximum quantity held (ie total of all unit packages held).of each chemical listed.
3. An MSDS should be available for all hazardous substances used or produced at the workplace.
4. The register should be freely available for staff to consult for information on the storage and use of chemicals at all times (including after hours).

B. General storage conditions

- Maintain the minimum quantity of chemicals required for regular use.
- Shelving must be compatible with chemicals stored on them.
- No chemicals other than cleaning agents, should be stored under a sink.
- Store larger containers and corrosives in lower positions.
- On shelves over benches, glass containers > 1L or 1 kg must not be stored on shelves > 1.5m from the floor.
- Solid chemicals should be stored on upper shelves above liquid chemicals.
- Raised-edge shelving should be used where containers are to be accessed from both sides of a bench to prevent containers being pushed off shelves.
- Refrigerate highly volatile substances. (See V,D5)
- Store odorous chemicals requiring ventilation in a mechanically ventilated cupboard.
- Keep the storage area free from ignition sources such as sparks and away from direct sunlight.
- Label all storage areas and refrigerators appropriately.
- Use a segregated chemical storage system. (See V,C3).

C. Chemical Storage System

To ensure a safe storage system it is necessary to separate chemicals into categories which will not react with each other.

1. Classification of Chemicals

This procedure can be used to classify chemicals that are not fully labelled or with incomplete safety data.

- Obtain the Material Safety Data Sheet (MSDS) from your department's register or request it from the supplier of the chemical.
- From the MSDS ascertain:
 - the Dangerous Goods Class of the chemical; and
 - information on potential health hazards.
- Consult the *List of designated hazardous substances* (available in the office of the Faculty of Science Safety Officer) to see if the chemical is listed.
- When handling chemical mixtures, check to see if any of the components in the mixture are on the list. Ascertain their concentration in the mixture. Most substances are only classified as hazardous above a certain concentration in a mixture.
- If necessary, contact the manufacturer or supplier for hazardous substance details.
- If the toxicological, chemical or physical properties of the substance (or any of the components in a mixture) are unknown, then assume it is hazardous until further information is available.
- If the label contains any of the signal words, eg POISON, DANGEROUS POISON, CAUTION, WARNING or HAZARDOUS, then the substance is hazardous.

2. Non-hazardous chemicals

Chemicals that are not classified as Dangerous Goods and which are non-hazardous can be stored alphabetically.

3. System of segregation of chemicals (AS 2243.10)

The segregation system is based on the Dangerous Goods class that the chemical belongs to:

- Store Dangerous Goods Class 1 (explosive material) as required by legislation.
- Store Dangerous Goods Class 3 (flammable liquids) in a flammable liquids cabinet (see V,D below), separately from dangerous goods of any other class.
- Store Dangerous Goods Class 8 (corrosive substances) in corrosive-resistant areas, ie on capture trays under the benches or in special acid cabinets.
- Poisons and drugs should be stored according to legislative requirements. (*A section on Poisons and Drugs will be included in a future version*).
- When storing chemicals **on open shelves** in the laboratory, the guidelines in Table 1 should be followed to ensure segregation of chemicals not compatible with one another:

Table 1: Segregation of chemicals by Dangerous Goods Class

Class A	Class B
3	4.2, 4.3, 5.1, 5.2
4.2 or 4.3	3, 5.1, 5.2
5.1	3, 4.1, 4.2, 4.3, 5.2, 6.1, 8
5.2	3, 4.1, 4.2, 4.3, 5.2, 6.1, 8
6.1	5.1, acids, hypochlorites and other incompatibles
8 - acids	8 - alkalis
8 - acids	8 - hypochlorites
8 - acids	4.3
8 - acids	6.1 cyanides
8 - oxidising acids	3 combustible materials

NOTES ON TABLE CONTENTS:

- Dangerous Goods in Column A are incompatible with those shown in Column B.
 - Incompatible chemicals should not be stored together on shelves, either horizontally or vertically.
 - For small quantities of incompatible chemicals, segregation can be achieved with the use of spill trays.
 - Some Dangerous Goods of the same class may be incompatible with each other.
4. Special Storage &/or Regulatory Restrictions apply for:
- Acrylonitrile
 - Cyanides
 - Scheduled poisons
 - Radioactive substances

(Reference sections for these substances will be included in a later version)

D. Storage limits for chemicals held in laboratories

A section on maximum quantities of each class of dangerous good that can be stored in laboratories will be included in a later version.

E. Flammable Substances

1. Limit the amount of flammable substances that are stored on laboratory shelves to a minimum.
2. Store large containers of flammable liquids in approved flammable liquids cabinets according to AS 1940, 1993:
 - Up to 250 L of flammable liquids may be stored in these cabinets.
 To store >100 L, approval must be obtained from the departmental Safety Officer (See D1 above).
 - Departments requiring flammable liquids cabinets should contact OHSE for details of the recommended types.

- . Ensure that the self-closing mechanism on the doors of the cabinet is operational at all times.
 - . Cabinets must not be located near paths of exit from the laboratory.
 - . Any 2 cabinets located in one area must be more than 10 m apart.
3. Storage of flammable substances in fume cupboards is only appropriate for short periods during usage.
 4. Flammable substances should never be stored near acids or oxidisers.
 5. Storage of flammable substances in refrigerators:
 - . Flammable substances must not be stored in unmodified, conventional refrigerators or freezers. Refrigerator or freezers used for the storage of flammable substances must be modified to eliminate sources of ignition by:
 - mounting the thermostat or temperature controls and associated relays outside the cabinet with only the bulb of the thermostat inside the cabinet;
 - ensuring that any opening in the cabinet around the thermostat is gas tight;
 - removing the light and door switch;
 - removing (or making inoperable) electric defrosting heaters;
 - removing the recirculating fan and motor provided for defrosting.
 - . All laboratory refrigerators that are **not** intrinsically safe must be labelled with appropriate warning signs, eg
- Danger - Flammable substances must not be stored in this freezer/refrigerator.***
- . Glassware and all other containers used to store chemicals to be checked prior to use and before being placed into storage. Only sound glassware and containers to be used. Damaged or suspect items to be disposed of into the correct sharps or waste bins.
 - . Check the effectiveness of seals shortly after placing glassware in freezers or refrigerators. Stoppers fitted at room temperature may need to be reseated after the glassware has been stored for some time at low temperatures.
 - . Containers to be labelled correctly showing contents, date of preparation and the name of the student or researcher concerned.
 - . All containers to be stored in such a way within the freezer or refrigerator as to avoid the risk of them tipping or spilling if disturbed or if the appliance is bumped or jarred.
6. Dispensing of all flammable or combustible liquids should be carried out in fume cupboards.

F. Examples of incompatible chemicals¹

A brief summary of incompatible chemicals is provided as further information. These substances may react violently when mixed and must be kept apart. The list is a summary of important examples taken from the range of hazardous chemicals. For a complete reference consult the relevant MSDS for any substances used.

Chemical	Not compatible with
Acetylene	Chlorine, bromine, fluorine, copper, silver & mercury salts
Activated charcoal	Calcium hypochlorite and other oxidising agents
Alkali metals	Water, carbon tetrachloride and other halogenated alkanes, carbon dioxide, halogens
Aluminium alkyls	Water, alcohols and acids
Ammonia	Acids, silver salts
Ammonium nitrate	Powdered metals, flammable liquids, chlorates, nitrates, sulfur, fine particulate organic or combustible material
Bromine	See chlorine
Chlorates	Ammonium salts, acids, powdered metals, sulfur, fine particulate organic or combustible substances
Chlorine	Ammonia, acetylene, butadiene, alkali metals, hydrogen, powdered metals
Chromium (VI) oxide	Naphthalene, camphor, glycerol, petroleum spirit, alcohols
Copper salts	Acetylene
Cyanides	Acids
Ethanol	Concentrated nitric acid
Flammable liquids (See V, E)	Ammonium nitrate, chromium (VI) oxide, hydrogen peroxide, nitric acid, sodium peroxide
Fluorine	Consult OHSE before using
Hydrogen fluoride	Consult OHSE before using Ammonia, laboratory gas or liquid
Hydrogen peroxide	Copper, chromium, iron metals and metal salts, alcohols, acetone, organic substances, aniline, nitromethane, combustible substances

Chemical	Not compatible with
Hydrogen sulfide	Fuming nitric acid and other oxidising agents
Iodine	Ammonia (gas or solution)
Mercury & mercury salts	Acetylene
Concentrated nitric acid	Aniline, hydrogen cyanide, hydrogen sulfide, flammable liquids and gases, all alcohols
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohols, paper and wood
Phosphorus	Sulfur, oxygen containing compounds such as chlorates
Potassium	See alkali metals
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, concentrated sulfuric acid
Silver	Acetylene, ammonia
Sodium	See alkali metals
Sulfuric acid	Metal chlorates, perchlorates, and permanganates

VI. LISTING OF RELEVANT LEGISLATION AND GUIDELINES

A. Dangerous Goods

Dangerous Goods Act, 1985 (Victorian Legislation)

Dangerous Goods (Storage and Handling) Regulations 1989

Outlines the procedures required for the licensing and storage of dangerous goods.

Australian Code for the Transport of Dangerous Goods, 1992 (ADG Code, Federal Government)

This code is used as a guide to control the transport and storage of all potentially dangerous substances in Australia.

B. Hazardous Substances

Hazardous substances requirements essentially deal with use of substances in a workplace while dangerous goods laws cover storage (whether at a workplace or not) and transport. However, many substances classified as dangerous goods will also be hazardous substances.

Worksafe Australia (1994), *List of designated hazardous substances*, [NOHSC:10005 1994], Australian Government Publishing Services, Canberra.

Worksafe Australia (1994), *Approved criteria for classifying hazardous substances*, [NOHSC:1008 1994], Australian Government Publishing Services, Canberra.

Worksafe Australia (1994), *National code of practice for the control of workplace hazardous substances*, [NOHSC:2007], Australian Government Publishing Services, Canberra.

Worksafe Australia (1994), *National code of practice for the labelling of workplace substances*, [NOHSC:2012], Australian Government Publishing Services, Canberra.

Worksafe Australia (1994), *National code of practice for the preparation of material safety data sheets*, [NOHSC:2011 1994], Australian Government Publishing Services, Canberra.

Worksafe Australia (1991), *Exposure standards for atmospheric contaminants in the occupational environment*, 2nd edition [NOHSC:3008], Australian Government Publishing Services, Canberra.

Guidelines for Laboratory Personnel Working with Carcinogenic or Highly Toxic Chemicals. National Health & Medical Research Council May 1990 - Australian Government Publishing Service, Canberra.

C. Australian Standards

AS 1216, 1995, *Class labels for dangerous goods*, Standards Australia

AS 1940, 1993; Section 4.5: *The storage and handling of flammable and combustible liquids*, Standards Australia

AS 2030, Parts 1 to 4: *The approval, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases*. Standards Australia

AS 2243, 1990, *Safety in laboratories*, Standards Australia
Part 10 : Storage of chemicals is most relevant.

AS 2508, *Safe storage and handling information cards for hazardous material*, Standards Australia

VII. REFERENCES

¹Haski, R, Cardilini, G and Bartolo, William, C F (1992), *Laboratory safety manual*, CCH Australia, Sydney.

VIII. APPENDIX 1: Interpretation of Material Safety Data Sheets**MATERIAL SAFETY DATA SHEET****COMPANY DETAILS**

Company	Here you should find the name, address, telephone number and emergency telephone number of the Australian manufacturer or supplier
Address	
Telephone Number	
Emergency Telephone Number	

IDENTIFICATION

PRODUCT NAME

Here you should find the name of the product trade name and any other commonly used names for the product and any identification codes used by the manufacturer or supplier.

Other Names:**Manufacturer's Code**

UN Number
Dangerous Goods Class:
Subsidiary-Risk:
Hazchem Code:

There are different schemes to classify hazardous substances, UN Numbers are assigned to substances classified to Dangerous Goods for transport and storage.

Poisons Schedule:

Substances are also classified into Poisons Schedules under Poisons legislation. Hazard rating increases from Schedule 5 to Schedule 6 to Schedule 7.

Use:

Here you should find the common uses and methods of application.

PHYSICAL DESCRIPTION/PROPERTIES**Appearance:**

What the chemical usually looks and smells like. Appearance may be characteristic - a check on identify. Odour can give warning of hazardous airborne concentrations if odour threshold is below exposure standard (limit).

Viscosity indicates pumpability and ease of spread of spills.

Boiling Point (Melting Point)

Tells you what temperature a substance will undergo a change from liquid to gas (boiling point) or solid to liquid (melting point).

A low boiling point indicates a special fire hazard for flammable liquids or likely pressure build-up in container.

Vapour Pressure

Pressure created by vapour when the liquid or solid substance evaporates at the particular temperature. The higher the vapour pressure the greater the chance of inhaling it.

MATERIAL SAFETY DATA SHEET**PRODUCT NAME:**

Flash Point: This is the lowest temperature at which a liquid gives off enough vapour to ignite if an ignition source (eg spark or flame) is present

Auto-ignition Temperature: This is the minimum temperature required to start self-sustained combustion in the absence of a source of ignition (ie no spark or flame needed).

Flammability Limits: These indicate the concentration of the substance in the form of gas or vapour that is needed for it to ignite or produce an explosion. Ignition is less likely below the lower limit or above the upper limit. Compare it to an engine that won't start if the carburettor is set too lean (below lower limit) or is flooded (above upper limit).

Specific Gravity This indicates whether the substance will sink or float in water.

Solubility in Water: This indicates the degree to which substances will dissolve in water at a particular temperature. It can help determine the appropriate emergency fire/spill procedures. Dilution of a soluble substance can reduce fire, toxic or corrosive hazards.

OTHER PROPERTIES

pH pH on a scale of 1-14 is a measure of the degree of acidity or alkalinity of a substance when dissolved in water.

Strong acid	pH 1-2 (Sulfuric acid)
Water (Neutral):	pH 7
Strong Alkali:	pH 11.5-14 (Caustic Soda)

pH is a measure of the corrosive hazard to eyes, skin, respiratory tract, food canal and reactivity with many metals.

Evaporation Rate: This indicates how much of the mixture is likely to evaporate if spilt or heated.

INGREDIENTS

Chemical Entity:
CAS Number:
Proportion:

Preferably you should find here the precise chemical name of each ingredient, the CAS number which precisely identifies each ingredient and the proportion of each ingredient in the product.

At the very least you should find here:

1. the precise disclosure of the name of each hazardous ingredient and the proportion of each hazardous ingredient in the product.
 2. the generic (chemical group) name for other ingredients and an approximate guide to their proportions (>60%, 30-60%, 10-30%, <10%).
-

MATERIAL SAFETY DATA SHEET**PRODUCT NAME:**

HEALTH HAZARD INFORMATION

HEALTH EFFECTS

Acute:

Here you should find the health hazards of acute (short term) and chronic (long term) exposure due to swallowing, eye and skin contact and inhalation.

Swallowed:

Eye:

Skin:

Inhaled:

Chronic:

FIRST AID

Swallowed:

Eye:

Skin:

Inhaled:

This section covers the care to be used until qualified medical help can be obtained.

ADVICE TO DOCTOR

This includes any known antidotes.

Carcinogen Category 1

- Established human carcinogen

Carcinogen Category 2

- Probable human carcinogen

Carcinogen Category 3

- Substances suspected of having carcinogen potential

ppm = parts of vapour per million parts of contaminated air by volume at 25°C and one atmosphere pressure
mg/m³ = Milligrams of substance per cubic metre of air

ENGINEERING CONTROLS

Here you should find general/local exhaust ventilation required when you use the product.

PERSONAL PROTECTION

Here you should find any specific type of respirator, clothing or other protective equipment. Equipment suppliers should be consulted for recommended equipment as requirement may vary with the application (eg other chemicals may be mixed/used with the chemical in question which could alter protective equipment recommendation).

FLAMMABILITY

Here you should find precautions that must be followed to avoid fire hazards (eg ventilation, earthing)

MATERIAL SAFETY DATA SHEET**PRODUCT NAME:**

SAFE HANDLING INFORMATION

STORAGE AND TRANSPORT

Here you should find requirements for safe storage and transport of the product (including whether the Australian Code for Transport of Dangerous Goods by Road and Rail and Dangerous Goods Storage and Handling Regulations classifies the substance as a Dangerous Good).

SPILLS AND DISPOSAL

This section will tell you how to safely stop and clean up a spill and safely dispose of waste.

FIRE/EXPLOSION HAZARDS

This section explains the risk of fire and explosion and what hazards might exist such as dangerous gases. Information on how to safely fight a fire involving the chemical will also be provided.

PRECAUTIONS FOR USE

EXPOSURE STANDARDS

Exposure standards established by Worksafe Australia (National Occupational Health and Safety Commission) represent airborne concentrations of individual chemical substances which according to current knowledge, should neither impair the health of, nor cause undue discomfort, to nearly all workers. Exposure standards may be expressed as:

- (1) Time-Weighted Average (TWA)
Concentration over an 8 hour working day for a 5 day working week. The TWA exposure standard is designed to protect workers against the adverse effects of long term exposure.
 - (2) Short Term Exposure Limit (STEL)
STEL are concentrations averaged over 15 minutes. STEL are designed to protect workers against irritation or other acute effects of short-term exposure.
 - (3) Peak Limitation
This is a maximum concentration that should not be exceeded, measured over the short possible period of time not exceeding 15 minutes. The Peak Limitation is designed to protect workers from the acute effects of fast acting substances.
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- (4) General Excursion Limits
Even where the TWA is not exceeded there should be control of concentration excursions above the TWA. As guide, excursions should not exceed 3 times TWA for more than 30 minutes per 8 hour shift or more than 5 times TWA at any time (in absence of STEL or Peak Limitation that takes precedence over excursion recommendations).

Exposure standards may have notations:

Sk - Absorption through the skin may be a significant source of exposure.

Sen - Sensitiser (substance that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical).

POINT OF CONTACT

This section will tell you the telephone number and job title of the person you contact for further information.

DATE OF ISSUE

The date of issue of the MSDS is usually found on the first or last page of the MSDS.

ADDITIONAL NON EMERGENCY INFORMATION, CONTACT

Any other characteristics that may affect the safe use, storage handling or disposal of the chemical (eg environmental toxicity data) may be included in this section.