



Chemical Risk Management

**LABORATORY
USERS'
QUICK
REFERENCE
GUIDE**

FOREWORD

This quick reference guide is designed to provide you with step-by-step guidance on the basic procedures you will need to use chemicals safely in the laboratory,

Each section below gives you information on a process or procedure that needs to be followed to meet the University's standards of professional practice in our laboratories.

For further information, please refer to the **Chemical Risk Management Protocol**
<https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics/laboratory-safety/chemical-safety/lab-rules-and-safe-methods.html>

Please note: Terms that appear in bold italics type are defined in the glossary at the back of this guide.

Acknowledgements: Written and assembled by Nicky Vernon and Keith Richards.



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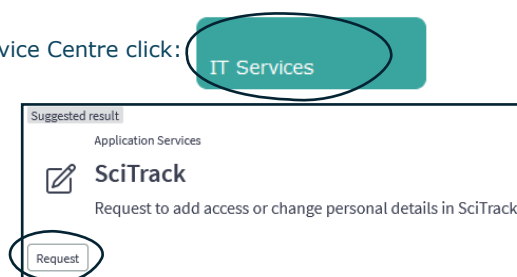
INTRODUCTION FOR NEW USERS

Getting started with SciTrack

- **SciTrack:** University wide database used to keep track of chemicals, restricted biologicals, and GMOs.
 - Contains details and safety information for most of the chemicals held within the University.
 - Important tool that is referenced throughout this user guide.
 - For quick guides and further information, visit the **SciTrack** website:
 - <https://www.auckland.ac.nz/scitrack>

Signing up to SciTrack

1. Go to <https://www.staff.auckland.ac.nz/> and under Staff Service Centre click:
2. Search for **SciTrack** in the search bar at the top of the page.
3. The first suggested result is '[Request to add access or change personal details in Scitrack](#)'. Click request.
4. Under the heading "What do you need to do?"
 - Choose: Request access to Scitrack'.
5. Complete form, then click submit.



If you are not staff and cannot access the Staff Service Centre, a **DLP** can request Scitrack access for you.

SciTrack Barcodes

All SciTrack-based chemicals should have a **SciTrack QR barcode sticker**.

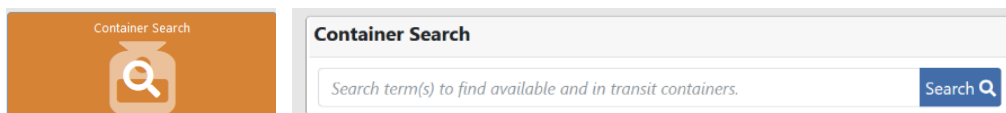
- A. Sticker with two QR codes (large and mini) with the barcode number e.g. UOAC000065383
- B. Sticker is only the mini QR barcode.
 - A QR scanning app, smartphone or barcode scanner can be used to find out the barcode number of the mini QR code.



LOCATE IT: Locating chemicals in SciTrack

Main home page of SciTrack:

- Locate the orange 'container search' tile OR **Container** search bar:



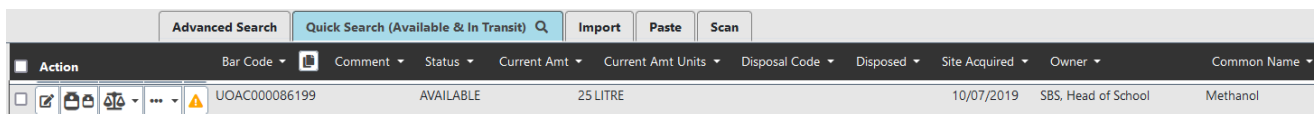
Search options:

Type one of the following identifiers into the **container** search bar to locate a university-based chemical.

- **SciTrack barcode number** e.g. UOAC000065383
- **CAS number** e.g. for methanol **67-56-1**.
 - **CAS number:** unique identifier for each specific form of a chemical substance.
 - series of numbers separated by hyphens (xxxx)xx-xx-x. The first part of the series varies between 2 and 6 digits.
- Chemical name: be as specific as possible, add concentration or state of chemical.
 - **Note:** Hazards of chemicals can differ depending on composition and concentration.

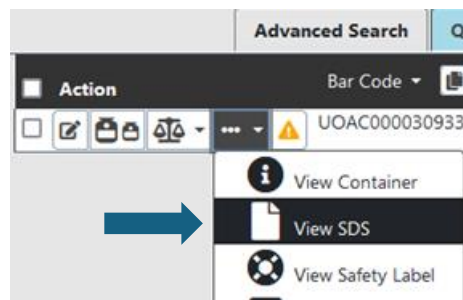
Locating safety information in SciTrack

The search page will look like the one below:



Safety data Sheets (SDS) through SciTrack:

To get the SDS of the chemical click on the three dots (...) and from the dropdown select 'View SDS'. Details of a SDS will be explained later in this user guide (explained in Learn it: Safety Information-Safety Data Sheets).

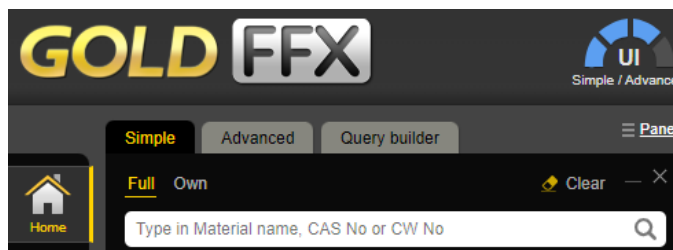


Locating Safety information in Gold FFX

Gold FFX is available on the university library database and contains SDS tailored to NZ regulations for most chemicals.

Gold FFX

1. Visit the University of Auckland Libraries and Learning Services Website Libraries and Learning Services Website.
2. Go to Library/Databases.
3. Search for GoldFFX.
4. Press *Direct Connect*.
5. Look for the SDS using material name or **CAS number**.



More details and a step by step guide can be found at the website below.

<https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics/laboratory-safety/chemical-safety/databases.html>



LEARN IT:

Chemical Hazard Classes and classification

UN DG classification

You will find this information in the land transport section of an SDS. It identifies the most severe hazard class for chemicals using class and **packing group**.

- **Class 1 – Explosives**
- **Class 2 – Gases**
- **Class 3 – Flammable Liquids**
- **Class 4 – Reactive Compounds**
- **Class 5.1 – Oxidisers**
- **Class 5.2 – Organic Peroxides**
- **Class 6.1 – Toxic Substances**
- *Class 6.2 – Infectious Substances**
- *Class 7 – Radioactive Substances**
- **Class 8 – Corrosive Substances**
- *Class 9 – Miscellaneous**

**Will not be referred to in this guide.*

Most classes are assigned to **packing groups (PG)** in accordance with the degree of danger they represent:

- **PG I: high** danger
- **PG II: medium** danger
- **PG III: low** danger

HSNO classification

HSNO classifications are also used in safety data sheets and safe methods of use (**SMOU**, pg. 11) to class hazardous chemicals. This classification is used in New Zealand legislation.

HNSO classification:

- **Class:** Very similar to UN DG classification
 - Some classes may have subclasses.
- **Category:** Degree of hazard signaled by a letter A to E.
 - 'A' categories indicate highest hazards, e.g. 6.1A is more hazardous than 6.1B.
 - Category A is comparable to PG I used for UN DG.

GHS classification




The GHS system is used to identify the different types of hazards posed by chemicals including physical, health or the environment. This is not UN DG class dependent.

- **Hazard class:** The nature of the hazard the substance has, and for toxicity the route of exposure.
 - E.g. Acute oral toxicity
- **Hazard category:** Severity of hazard within the hazard class, ranked category 1-4.
 - Category 1 is more severe than category 4.
 - E.g. Acute oral toxicity category 1 is more severe than Acute oral toxicity category 4.*
- **Pictograms:** provide warnings associated with certain hazard classifications.

Table of Hazard classes.

Hazard Pictogram	UN DG Classification	Risk posed
	Class 1 Explosives	Detonation.
	Class 5.2 Organic Peroxides	Heating may cause fire or explosion.
	Class 2 Gases	May catch fire or contribute to fire.
	Class 3 Flammable Liquids	May catch fire.
	Class 4 Reactive compounds	
	Class 5.1 Oxidisers	May cause fire or explosion, may intensify fire.
	Class 6.1 Toxic Substances	Acute oral, dermal and inhalation toxicity.
	Class 8 Corrosive Substances	Caustic: can cause severe burns or eye damage.

Table of warning hazards

Pictogram	Warning	Risk posed
	Irritation warning	Irritation immediately after use: <ul style="list-style-type: none"> • Lowest acute toxicity for oral, dermal and inhalation. • Eye irritation. • skin sensitisation.
	Health Hazard	Long term health hazard: <ul style="list-style-type: none"> • Respiratory sensitisation. • germ cell mutagenicity carcinogen. • reproductive toxicity. • Specific target organ toxicity after single/repeated exposure aspiration hazard.
	Ecotoxic	Acute hazards to environment including: <ul style="list-style-type: none"> • Aquatic environment. • soil organisms. • terrestrial vertebrates/invertebrates.

Note: Some substances will have more than one hazard, a corrosive chemical may also be toxic and flammable. Therefore, it is important to understand all hazard symbols, what class they are often associated with and the severity of each hazard.

Safety Information: Safety Data Sheets

Purpose of an SDS

- Primary source of class and hazard information of a chemical/substrate/solution.
 - Summary of the properties, hazards, storage, and proper use of a specific chemical.
- Limitations: generalised for industrial usage, so need to refer to laboratory specific safety information as well.

The important sections of a SDS for Methanol taken from Gold FFX are below:

METHANOL	
ChemWatch Review SDS	
Chemwatch: 1230 Version No: 8.1 Safety Data Sheet according to the Health and Safety at Work (Hazardous Substances) Regulations 2017	Chemwatch Hazard Alert Code: 3 Issue Date: 13/12/2021 Print Date: 08/04/2024 S.GHS.NZL.EN
SECTION 1 Identification of the substance / mixture and of the company / undertaking	
Product Identifier	
Product name	METHANOL
CAS number	67-56-1
Chemical name and CAS number should match your chemical of interest.	
SECTION 2 Hazards identification	
Classification of the substance or mixture	
Considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Classified as Dangerous Goods for transport purposes.	
Classification [2]	Flammable Liquids Category 2, Acute Toxicity (Oral) Category 3, Acute Toxicity (Dermal) Category 3, Serious Eye Damage/Eye Irritation Category 2, Acute Toxicity (Inhalation) Category 3, Reproductive Toxicity Category 2, Specific Target Organ Toxicity - Repeated Exposure Category 1
Label elements	
Hazard pictogram(s)	
Pictogram shows hazard type (and sometimes by association, class) of this chemical.	
SECTION 7 Handling and storage	
Storage incompatibility	▶ Avoid storage with reducing agents.
Lists incompatibilities for storage of chemical.	
SECTION 14 Transport information	
14.3. Transport hazard class(es)	Class 3 Subsidiary Hazard 6.1
14.4. Packing group	II
Indicates the UN DG class of the chemical, along with Packing group (degree of danger). Packing group I is more dangerous than packing group III.	

GHS classification:
Indicates hazards and their severity for this chemical.

Example for Methanol

Section 1: Identifying the substance.

- Chemical name and **CAS number** match methanol.

Section 2: Identifying hazards.

- Methanol is **flammable** and **toxic** with varying degrees of severity for different exposure types.
- Methanol requires special waste disposal.

Section 7: Handling and storage

- Methanol should not be stored with reducing agents.

Section 14: Transport information.

- Methanol is **flammable** (3) and **toxic** (6.1), both are **packing group** (PG) 2.



Safe methods of use (SMOU)

What is an SMOU?

- A specific control document to minimize hazards.
- Generic set of controls that can be applied to multiple substances of similar hazard (e.g. Class 3 **flammable** liquids).
- Prevents the need to establish procedures for each individual substance.
- Provides guidance for laboratory specific use of a chemical which SDS cannot provide.
 - incompatibilities, lab-based PPE and safety equipment.

Where can I find SMOUs?

- The University has a range of **SMOU** documents that covers safe laboratory work practices and how to use specific classes of chemicals.
<https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics/laboratory-safety/chemical-safety/lab-rules-and-safe-methods.html>

Using safety information (SDS & SMOU) to assess risk.

Use an SDS alongside the appropriate **SMOU** to assess the risk associated with the use of hazardous chemicals. Then, consider what controls you can put in place to minimize the risk.

Questions to consider before using a chemical.

- How much of this chemical will I be using?
- What is the form (solid, powder, liquid) of this chemical?
- What are the main hazards of this chemical?
- What is the hazard class of this chemical (if there is one).
- What other hazards could be introduced? E.g. heating or combining different chemicals.
- What safety equipment will I need access to?
- What level of personal protective equipment is required?
- Do I know how to deal with a spill of this chemical?
- How should this chemical be stored?
- How should this chemical be disposed of?
- Are there any incompatibilities with this chemical?
- Do I have the knowledge and/or authorisation to handle the chemical safely?
- If required, do I have an appropriate person available to supervise or assist if something goes wrong?

If in doubt, always ask a designated laboratory person (DLP) or senior technician in your lab. They are there to help you be safe.

For more information about risk assessment, see sections 7-8 of the Using Chemicals guidelines
<https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics/laboratory-safety/chemical-safety/lab-rules-and-safe-methods.html>

USE IT:

General chemical safety

- Diluting chemicals: 'Acid to water, not water to acid'
 - Never add water to a powdered substance to dilute it, it will at first create a highly concentrated solution that could be a hazard.
 - Adding the substance to the full volume of water will first create an extremely diluted solution, which can then be controlled.
- Never carry a chemical/solution bottle by the neck or the lid.
 - Always hold the base of the container with two hands.
- Never go in a lift or confined/closed off spaces with **cryogenic liquid** or **volatile** chemicals.

Chemical safety equipment: Fume hoods

A fume hood should be used when:

- Decanting or using **flammable** substances e.g ethanol.
- Using substances that are **toxic** via inhalation.
- Using substances that are extremely **volatile**.
- Evaporating excess/left over liquid nitrogen.

Using a fume hood:

- Check the **fume hood** is uncluttered so air flow is not impeded.
- Keep shield below maximum working level (usually an arrow on the front of the **fume hood**).
- Work with your arms under the shield and your head outside of the shield.
 - DO NOT put your head into the **fume hood** when you are working.

Personal protective equipment (PPE)

General PPE

Always worn in the lab:

- Lab coat
- Closed toe shoes
- Properly rated safety glasses
 - Must be worn when handling hazardous chemicals (unless a specific risk assessment for your laboratory deems it unnecessary).
 - Prescription eyeglasses are not adequate as eye protection.



LAB COATS
REQUIRED



SAFETY
EYEWEAR
REQUIRED



CLOSED TOE
FOOTWEAR

Gloves

How to use gloves with chemicals.

- Select appropriate glove for chemical type: check SDS and glove safety charts.
- Change gloves immediately if contaminated, torn or punctured.
 - When removing gloves, avoid contact with the outside of the glove.
- Do not reuse gloves.
- Do not touch door handles.
- Consider double gloving when using an extremely hazardous chemical.



PROTECTIVE
GLOVES
REQUIRED

Glove types for common hazardous chemicals.

Chemical (concentrated)	CAS No.	Latex	Nitrile	Neoprene
Acetic Acid	64-19-7	G	G	E
Acetonitrile	75-05-8	F	NR	F
Ammonium Hydroxide	1336-21-6	G	E	E
Chloroform	67-66-3	NR	F	F
Dimethyl Formamide	68-12-2	E	NR	G
Ethanol	64-17-5	G	G	E
Ethyl Acetate	141-78-6	P	NR	F
Formaldehyde	50-00-0	E	E	E
Hydrochloric acid	7647-01-0	G	E	E
Isopropanol	67-63-0	E	E	E
Methanol	67-56-1	E	E	E
Nitric Acid	7697-37-2.	F	NR	G
Phenol	108-95-2	G	NR	E
Sodium Hydroxide	1310-73-2	E	G	E
Sulfuric Acid	7664-93-9	NR	NR	F
Xylene	106-42-3	NR	G	P

E=Excellent
G=Good
F=Fair
P=Poor
NR=Not Recommended

Change gloves after use

Change gloves immediately after contact

Face protection:

- **A full-face mask:** or additional face protection will be required when pouring **corrosive** or **cryogenic** substances (e.g. liquid nitrogen).

RESPOND TO IT:

Emergency equipment

Location of emergency equipment

Each lab will have a health and safety induction where you should be told:

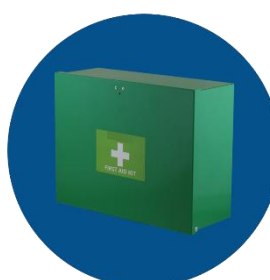
- Name and location of nearest first aider and fire warden on your floor.
- Location of the safety equipment in the lab and around the building.
 - fire alarm/exits/blankets/extinguishers, safety shower, first aid kits, eyewash and spill kits.

Safety shower



Stand underneath the shower head and pull the handle downwards.

First aid kit



Contains bandages, plasters, sterile saline solution and burn creams.

Eyewash

- Activate eyewash and allow the stream of water to filter through your eyes.

Spill kits.

Look inside your lab spill kit to familiarise yourself with the contents. The kit should have a spill response kit guide to assist with the procedure.



Small Lab spill kit



Emergency responses and procedures

Major spill- Toxic or flammable

- **Evacuate** the area immediately and tell everyone in the vicinity to leave.
- **Call** for assistance (Lab manager, DLP, technical staff).
- **Activate** emergency shutdown button and/or spill button (where available).
- **Contain** spill- cover with absorbent material, cover drains (only when there is no risk).
- If spill cannot be contained:
 - Call fire service 111
 - Name
 - Location of spill
 - Substance involved in spill.
 - Quantity of spill
 - Size of spill (approx. metre²)



Minor spill

Can be cleaned up safely with little risk to personnel.

- **Clear** immediate area.
- **Extinguish** any ignition sources if the chemical is **flammable**.
- **Call** for assistance (DLP, technical staff).
- **Wear** appropriate PPE.
- **Stop the source** (If safe to do so)
 - E.g. Plug leak, shut off valves, solvent containers into flammable cabinet.
- **Use spill kit** to clean up and prevent access to drains where possible.
 - If the chemical is **corrosive**, consider neutralising it or use spill kit specific to class type.
- **Wipe up spill** towards centre.
 - Use damp cloth to pick up broken glass.

Major chemical fire



- **Evacuate** area immediately.
- **Activate** fire alarm.
- **Call 111** fire service and report:
 - Location and type of fire (chemicals involved)
 - Hazards in the area
 - casualties

Minor chemical fire



Can be put out with little risk to personnel.

- **Remove heat/fuel source.**
 - Heating elements, Bunsen burners, gas lines.
- **Vessel fire** e.g. beaker of ethanol:
 - **Smother fire:** cover the top of vessel with a fire blanket, a wet towel or bigger piece of glassware.

Chemicals in eyes

- **Wash clean cool water over eyes and under eyelids for 15-20 minutes.**
 - Water from near the nose outwards.
 - Use an eyewash station where possible.
- Wash for **20 minutes or more** in case of contact with **alkali chemicals**, as these can cause serious damage without much pain.
- **Check SDS:** Ask someone to check SDS for further medical advice.
- Seek medical attention.
- Notify lab manager/supervisor.

Chemical ingestion



- **Call the Poisons Information Centre** for advice 0800 764766.
- **Do not induce** vomiting or ingest fluids **unless** advised by the Poisons Information Centre or medical professional.
- **Notify** lab manager/supervisor.

Reporting

It is important that the University can learn from incidents and keep everyone informed of potential risks. Please report all incidents. Your supervisor or person in charge will assist you with filling out an online incident report. Link to reporting: <https://www.auckland.ac.nz/en/health-safety-wellbeing/report-concerns-hazards/injury-incident-observations-reporting.html>

STORE IT:

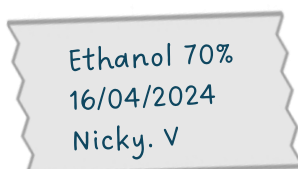
Labelling

Labelling of chemicals/solutions made or decanted in the lab.

Ensure labelling will not come off the bottle.

- Avoid writing directly onto the bottle as this can be rubbed off easily.
 - Use masking tape, or a paper label covered with sellotape.

All containers with chemicals must be labelled with:



- Identity of substance
- concentration
- Preparation date
- Full name or initials.

Note: Proper labelling that does not deteriorate is especially important for disposal of chemical waste. Unknown waste can cost as much as \$200 to dispose of when the contents are unknown.

Storage and segregation for different chemical classes

Correct segregation of chemicals mitigates the risk of incompatible chemicals coming into contact during storage and causing an unwanted reaction. In case of a **flammable** chemical fire, we want to ensure that substances that could intensify the fire or produce **toxic/corrosive** smoke are kept well away.

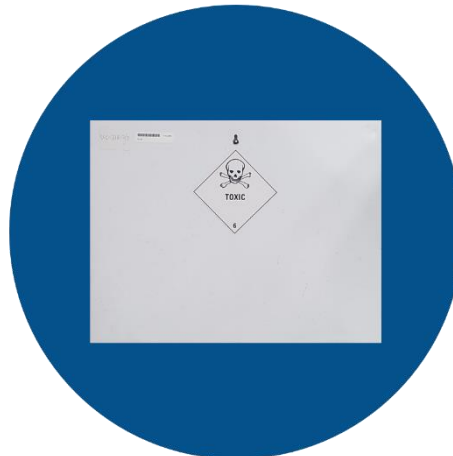
Note: Detailed information will be found in the corresponding **SMOU** for each chemical class. Examples of storage units for class 3, 6.1 and 8 are below.

Flammable liquids (Class 3)



Yellow flammable cabinet

Acutely toxic (Class 6.1 PG I)



Secured in locked toxic cabinet

Corrosives (class 8)



Corrosive Cabinet

- Corrosive cabinet (grey or light blue)
- Store acids and bases separately when in the same cabinet.
- Acetic acid is a **flammable** and **corrosive** chemical, but it must be kept in a flammable cabinet.

Special considerations

Nitric acid

- Nitric acid should be stored in a corrosive cabinet.
- It **CANNOT** be stored alongside **corrosive** bases such as KOH and NaOH, ammonia, acetic acid, formic acid, chloroform or any **flammable** chemicals.

As a lab member it is your responsibility to put chemicals back where they belong, and if you are unsure, ask.



DISPOSE IT:

DO NOT dispose of any chemical down the sink.

DO NOT mix waste chemicals.

Talk to your DLP/senior technician for chemical disposal practices in your lab.

DLPs, remember:

- Chemicals must be disposed of in **SciTrack**.
- For detailed disposal procedures for hazardous waste see 'Chemical Risk Management Protocol: Using Chemicals-Disposal of hazardous waste.

GLOSSARY

Note: This glossary is to assist with the understanding of these terms within the context chemical safety and management. These definitions include but are not limited to the following information.

CAS number: unique identifier for each specific form of a chemical substance. A series of numbers separated by hyphens with the following structure (xxxx)xx-xx-x. The first part of the series varies between 2 and 6 digits.

Container: In SciTrack, a container refers to the details of the physical container of a substance, each with a unique barcode. For example, methanol is the material and the physical bottles in different laboratories across the University are the containers. You can search for a specific container (bottle of methanol) using SciTrack barcode, or just the material name in the container search bar.

Corrosive: destroys/breaks down/burns/dissolves other substances. E.g. burns skin on contact.

Cryogenic substance: liquefied gases that are kept in their liquid state at extremely low temperatures e.g. nitrogen.

Flammable: Low ignition temperature including spark ignition.

Fume hood: A ventilated, enclosed piece of safety equipment used to restrict hazardous fumes, vapours and particulate matter that may arise while the hazardous material is in use.

GHS classification: A hazard classification that does not include a chemical class, but is categorised by nature of hazard including physical, health or environmental. It can also include routes of exposure. The severity of the hazard is ranked 1-4, with 1 being the most severe.

HNSO classification: A hazard classification system that uses numbered classes and subclasses to categorise hazardous chemicals by their properties. The degree of hazard is ranked from A-E, with A being the most hazardous.

Packing groups (PG): A ranking system used within UN DG in accordance with the degree of danger hazardous chemicals represent.



Pictograms: Icons that provide visual warnings associated with certain hazard classifications.

Safe method of Use (SMOU): Documents that specify a set of safety controls and laboratory specific requirements that can be applied to a variety of chemicals/substances within the same hazard class e.g. class 3-flammable liquids.

SciTrack: University of Auckland database that is used to manage and track chemicals, restricted biologicals, and genetically modified organisms within the University.

SciTrack QR barcode sticker: A unique identifier for physical containers of substances within the SciTrack database.

Toxic: A chemical that negatively affects biological processes of organisms and depending on exposure route can cause death, temporary incapacitation, or permanent harm.

UN DG: A hazard classification system used for transport of hazardous chemicals. It identifies the most severe hazard class for chemicals using class and packing group. Chemicals are classed 1 to 9 depending on their hazard type. Packing group I is the most severe, while packing group III is the least.

Volatile: easily vaporised from liquid to gas at relatively low temperatures.