Waipapa
Taumata Rau
University
of Auckland

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.

CONTENTS

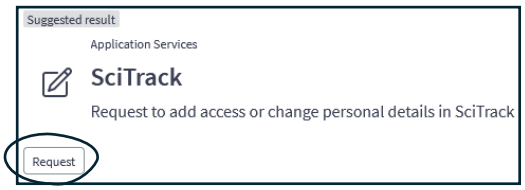
INTRODUCTION FOR NEW USERS

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 within the Staff Service Centre (SSC), select IT services.
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. UOAC000129595

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 '**container** search' tile OR **Container** search bar:

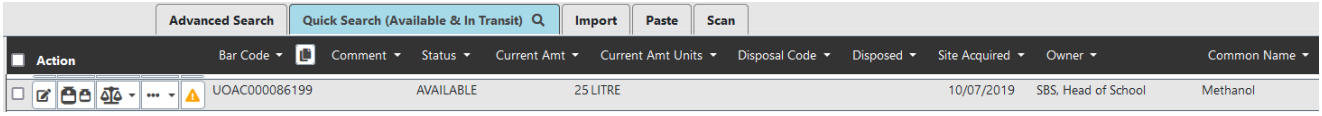
Search options:

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

- **SciTrack barcode number** e.g. UOAC000086199
- **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:

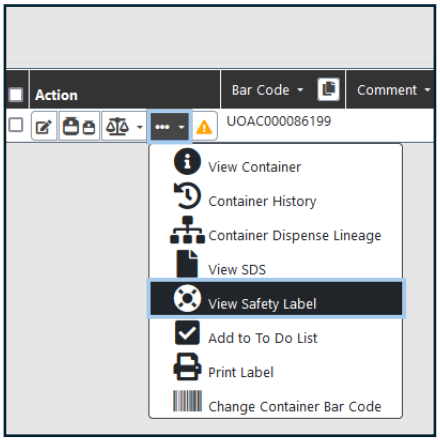


Finding safety information on the container search page

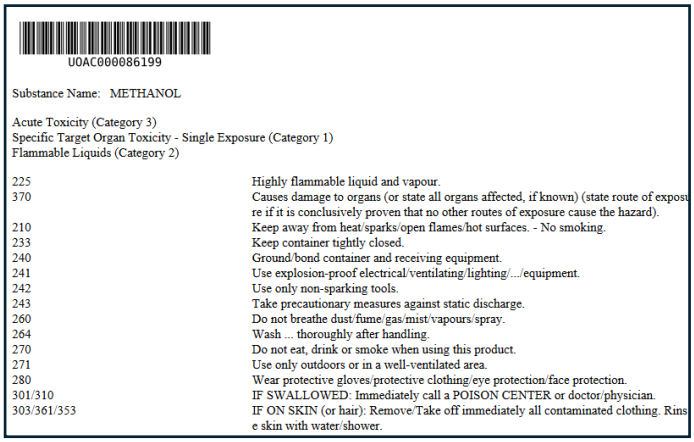
Click the '…' dropdown menu and select 'View safety Label' (A).

A PDF with the substance name and an overview of the associated safety warnings will pop up (B).

A



B



UOAC000086199

Substance Name: METHANOL

Acute Toxicity (Category 3)
Specific Target Organ Toxicity - Single Exposure (Category 1)
Flammable Liquids (Category 2)

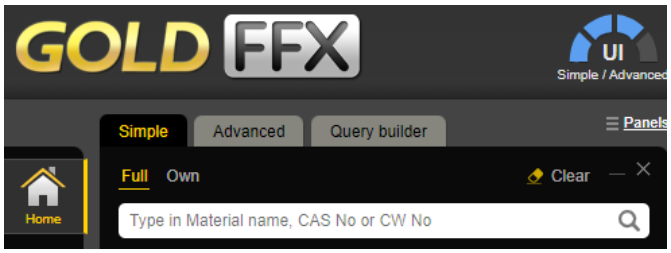
225	Highly flammable liquid and vapour.
370	Causes damage to organs (or state all organs affected, if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard).
210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
233	Keep container tightly closed.
240	Ground/bond container and receiving equipment.
241	Use explosion-proof electrical/ventilating/lighting/.../equipment.
242	Use only non-sparking tools.
243	Take precautionary measures against static discharge.
260	Do not breathe dust/fume/gas/mist/vapours/spray.
264	Wash ... thoroughly after handling.
270	Do not eat, drink or smoke when using this product.
271	Use only outdoors or in a well-ventilated area.
280	Wear protective gloves/protective clothing/eye protection/face protection.
301/310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
303/361/353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

Locating Safety Data Sheets (SDS) 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 about databases and a step-by-step guide can be found using the QR code or 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.

HSNO 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.

* Class 4 is complex and has been condensed for this guide, for all sub-classes and details please refer to *Chemical Lifecycle Management* in the **Chemical Risk Management Protocol.**

Table of warning hazards

Pictogram	Warning	Risk posed
	**Irritation warning**	**Irritation immediately after use:** • Lowest acute toxicity for oral, dermal and inhalation. • Eye irritation. • skin sensitisation.
	**Health Hazard**	**Long term health hazard:** • Respiratory sensitisation. • germ cell mutagenicity carcinogen. • reproductive toxicity. • Specific target organ toxicity after single/repeated exposure aspiration hazard.
	**Ecotoxic**	**Acute hazards to environment including:** • Aquatic environment. • soil organisms. • terrestrial vertebrates/invertebrates.

Multiple hazards

Some substances will have more than one hazard.
E.g. A corrosive chemical may also be toxic and flammable.

It is important to understand ALL hazard symbols:

- what class they are often associated with
- severity of each hazard.

Additional resources

Link to safety video explaining hazardous symbols under *'GHS Labelling Explained'* (4-minute video).
https://auckland.safetyhub.com/category/en-hazsub/?region=au

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 an SDS for Methanol taken from Gold FFX are below:

METHANOL

ChemWatch Review SDS

Chemwatch Hazard Alert Code: 3

Chemwatch: **1230**
Version No: **8.1**
Safety Data Sheet according to the Health and Safety at Work (Hazardous Substances) Regulations 2017

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

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

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.

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.

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) II.

Safe methods of use (SMOU)

What is a 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 SMOU documents?

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

TAKE 5

Take 5 is a quick 5-point risk assessment that should be carried out before using a chemical.

Note: If using a Packing Group I chemical, it must be authorised by a principal investigator (PI).

1. IDENTIFY HAZARDS

Use an SDS/and or SMOU to identify hazards, including the form of the chemical (powder, liquid solid).

2. PREPARATION HAZARDS

Are hazards introduced during the preparation?
Will you be heating and/or mixing with other chemicals that may react?

3. PROTECTION (PPE/CONTROLS)

How will you protect yourself and others when doing the experiment?

4. EMERGENCY PROCEDURES

How will you deal with an emergency such as spills, splashes and fires?
Where is the safety equipment (eyewash, safety shower) if required?

5. DISPOSAL

How will you dispose of the chemical and by-products/waste that form during the experiment?

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

- Before using a chemical for the first time, the 5-step risk assessment 'TAKE 5' should be carried out. Refer to page 11 for more details.
- Diluting chemicals: Acid to water, not water to acid.
    - Determine hazards of adding water to a powdered substance to dilute it, it will at first create a highly concentrated solution.
    - 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

- 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.

Gloves

How to use gloves with chemicals:

- Select appropriate gloves 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.

Face protection

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

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	Change gloves after use
P = Poor	Change gloves immediately after contact
NR = Not Recommended	

STORE IT

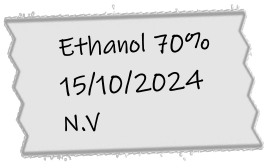
Labelling

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.

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 to personnel).
- If spill cannot be contained:
    - Call fire service 111
        - Name
        - Location of spill
        - Substance involved in spill.
        - Quantity of spill
        - Size of spill (approx. metre^2)

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.
- **Wipe up spill** towards centre.
    - Use damp cloth to pick up broken class.

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 burns

- Brush off dry chemicals
- **Flush liquids from the skin with cool running water for at least 15 minutes**. Use a safety shower where available.
- Remove any contaminated clothing.
- Wrap skin exposed to the chemical with dry sterile dressing or clean cloth, protected from pressure and friction.
- Watch for symptoms of shock: feeling faint, pale or breathing irregularly.
- Seek medical attention.
- Notify the 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-incidents-observations-reporting.html**

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 of 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: The Globally Harmonised System (GHS) is 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.

HSNO classification: The hazardous substances and new organisms (HSNO) classification system 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. Packing group I is the most severe, while packing group III is the least.

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

Principal Investigator (PI): An academic staff member who is the lead researcher responsible for laboratory projects and is usually the holder of an independent grant administered by the University.

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: The United Nations Dangerous Goods (UN DG) hazard classification system is 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.


Biochemical
Toxic. Tóxico.
Giftig. Vergiftig.
Tossico. Tóxico.
Giftigt.

Waipapa
Taumata Rau
University
of Auckland