# SAFETY AND SCIENCE

Jane Lieshout, Jacqui Alcock, Samantha York & Sarah Hay

# SAFETY AND SCIENCE

- A science/pūtaiao programme has certain potential risks. Yet, with careful planning,most risks can be managed. It is essential for all involved in science teaching and learning to develop a positive approach to a safe and healthy environment in the laboratory. Health and safety in science classrooms and laboratories is the responsibility of the board of trustees, principals/tumuaki, teachers/kaiako, technicians/taiwhanga/kaimahi, and students/ākonga – each assuming their roles and responsibilities. Health and safety should be an integral part of planning, preparing, implementing, and reviewing any science programme.
- This document provides information and guidance to teachers and technicians to support them in developing a culture of safety and to ensure the safety of students, staff and others in schools.


Do you fully understand the hazardous nature of the substances you are working with? Do you require further training?

Does your school annually appoint the laboratory manager?

Do all chemicals have SDS cards? Do you understand the information on an SDS? Are they accessible to teachers/students when chemicals leave the prep area?

Do your teachers have a full understanding of health and safety?

# SAFETY AND SCIENCE – WHO IS RESPONSIBLE?

**5.2.2 Worker duties (technicians)**

- Take reasonable for their own health and safety
- Take reasonable care that their acts or omissions do not adversely affect the health and safety of others
- Comply with reasonable instructions given by the PCBU to allow the PCBU to comply with the HSWA

NOTE **(pg 52)**: - A laboratory user may cease, or refuse to carry out, a procedure if the user believes that carrying out the procedure would expose the user, or any other person, to a serious risk to the user's or other person's health or safety arising from an immediate or imminent exposure to a hazard.

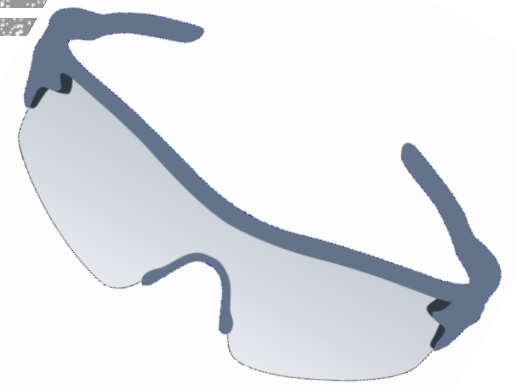
# SAFETY AND SCIENCE – WHO IS RESPONSIBLE?

**32 Technicians**

The Board of Trustees (PCBU) is responsible for providing a safe working environment and personal protective equipment in order for the technician to carry out their duties safely. There should be:-

- adequate ventilation in prep rooms
- dangerous goods cabinets should be vented to the exterior
- safe spark free heating
- access to a fume cupboard
- access to a phone line in case of emergency
- provide suitable PPE and eye wash, shower facilities in case of emergency
- non-slip flooring
- office space separate to the laboratory prep room

# SAFETY AND SCIENCE – WHO IS RESPONSIBLE?



**32 Technicians (continued)**

When working with hazardous substances in the laboratory:

- Long hair must be tied up away from the face.
- A heavy-duty cotton or cotton-polyester-blend lab coat with long sleeves mu
- Barrier cream can be applied to hands before putting on gloves to provide an add layer of protection.
- Gloves should be chosen using a glove chart for their appropriateness for the task.
- Safety goggles must be worn when handling corrosive hazardous substances and when heating anything.
- A full-face shield must be worn when necessary.
- An appropriate respirator must be used if fumes are present and you are unable to use a fume cupboard (for example, in a chemical spill). The correct cartridges for the purpose must be used (for example, organic vapours and acids) and the respirator must have been fit tested for the person needing to use it

# SAFETY AND SCIENCE – WHO IS RESPONSIBLE?

**7.5 What are the technician's/taiwhanga kaimahi responsibilities?**

Technicians support the laboratory manager and teachers in managing the practical requirements of science programmes. They typically prepare experiments and demonstrations, make up solutions, order equipment and hazardous substances, tidy up laboratories and support teachers in day-to-day teaching in school laboratories.

Technicians may also be appointed to the laboratory manager position or may work closely with the laboratory manager to support them in their duties.

- ensure preparation areas are locked and hazardous substances are secure
- ensure hazardous substances are stored in a safe manner
- inventory of hazardous substances
- correct labelling of decanted or diluted substances and prepared solutions
- appropriate disposal of laboratory waste
- risk assessment for procedures they carry out involving hazardous substances or other hazards (e.g. making solutions, removing scalpel blades)
- ensure availability of ppe and emergency equipment
- being aware of approved hazardous substances and procedures

# SAFETY AND SCIENCE – STORAGE OF HAZARDOUS SUBSTANCES

**20 How should hazardous substances be stored?**

- keep quantities to a minimum
- shelves should be coated with an impervious coating (e.g. acrylic paint) or have absorbent covering and be earthquake-proof
- flammable liquids stored in a compliant flammable liquids cupboard
- toxic substances (acute toxicity category 1 (6.1A), acute toxicity category 2 (6.1B), and acute toxicity category 3 (6.1C) need to be secured (locked cupboard)
- incompatible substances should not be stored together - store by class of substance, then alphabetically within that class
- store acids in a dedicated cabinet. Store nitric acid separately.
- storage areas should be adequately ventilated

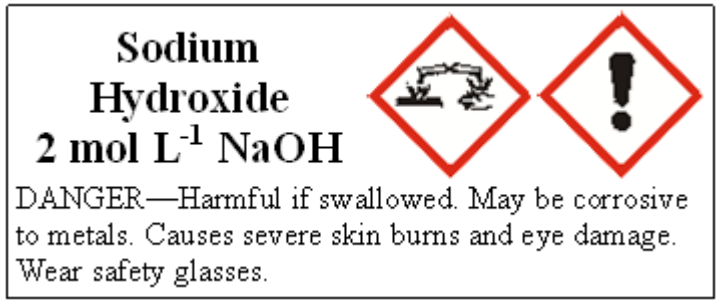
# SAFETY AND SCIENCE – STORAGE OF HAZARDOUS SUBSTANCES

**20 How should hazardous substances be stored?**


- secondary containment
  - use plastic trays underneath corrosive substances
  - use metal trays under organic solvents (where incompatible with plastic)
  - trays should be capable of containing at least 25% of the largest container
  - secondary containment is required at specific thresholds for certain classifications of substances if the substance is a pooling substance (that is, hazardous liquids and substances that may liquefy in a fire) ensuring that they will be contained if they escape from the container and can, subject to unavoidable wastage, be recovered (50L threshold).

# SAFETY AND SCIENCE – LABELLING

**25.2 Labels on secondary containers and prepared solutions**



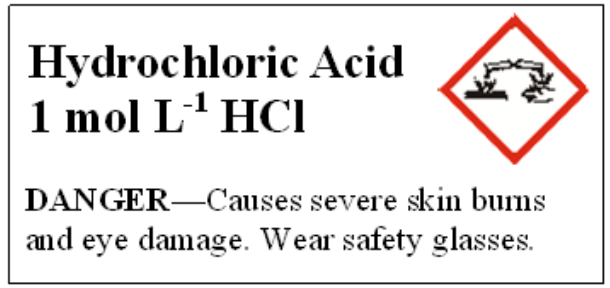

Secondary containers (this means decanted or diluted) of hazardous substances held in a laboratory need to be labelled (in English) with:

- the identity of the substance
- the concentration of the substance if diluted with a non-hazardous substance
- a pictogram (GHS) and hazard statement indicating the hazardous properties of the substance if the substance is classified as: a flammable gas (cat 1) (2.1.1), a flammable liquid (cat 1) (3.1A), a pyrophoric liquid (cat 1) (4.2A), a substances which in contact with water emits flammable gases (cat 1) (4.3A), an oxidising liquid (cat 1) (5.1.1A), an oxidising gas (cat 1) (5.1.2A), acutely toxic (cat 1, 2 or 3) (6.1A-C), a skin corrosive (cat 1A) (8.2A), causing serious eye damage (cat 1) (8.3A)
- and, if possible, an indication of the precautions required when handling the substance.
- While a container is labelled for a hazardous substance, use it only for that substance. If you relabel a container, before you place a new substance in it, remove the former label and clean the container of any residue of the previous substance first. Do not use containers that were previously used for food or drink. You do not have to label portable containers if you are going to use the substance so soon after you put it into the container that it is impracticable to label it. You also need to thoroughly clean the container immediately after you use it, to remove hazard.

# SAFETY AND SCIENCE – LABELLING

**25.3 Containers for immediate use (small containers)**

- For substances to be used or available for use within a laboratory session, held in small containers label in accordance with Part 18.9: so far as is reasonably practicable, label as per the previous slide
- If the small containers (e.g vials, reaction vessels) will be left unattended, the contents should be readily identifiable using direct labelling, sample coding, rack identification, or other means.
- As soon as no longer required, the hazardous substance must be either disposed of or labelled and the containers considered as storage containers.



# SAFETY AND SCIENCE – LABELLING

**25.4 Hazardous substance waste containers**

All containers of hazardous substance waste at the school are required to be labelled with the following information in English:

- 'WASTE'
- identification of the waste – for example, chemical name (as it appears on the safety data sheet (SDS)) or flammable waste
- name, address and business telephone number of the school accumulation start date (for external disposal)
- hazard pictogram and hazard statement consistent with the classification of the waste (if known) or likely constituents.

# SAFETY AND SCIENCE – Disposal

It is the responsibility of the Laboratory Manager to ensure that procedures are in place that allow for the safe disposal of hazardous substances and that these procedures comply with the EPA disposal notice. This sets out acceptable disposal methods for different classes of hazardous substances, and the requirements to limit environmental discharge to tolerable exposure limits (TEL) and/or environmental exposure limits (EEL).

Where disposal to sewage is considered acceptable, it is also necessary to consider the Trade Waste Bylaws in your region.

# SAFETY AND SCIENCE – LABELLING

**25.5 Unknown substances**

If students are required to determine the identity of an ‘unknown substance’, the container needs to be labelled with necessary handling and hazard information.

The product or chemical name and concentration of the substance needs to be readily accessible in case of an incident. The container could be labelled with a code that can be readily cross-referenced to provide information on the identity and concentration of the contents by a student, if necessary.

# SAFETY AND SCIENCE – LABELLING

Where a substance is in a laboratory, you should add:

- date received
- date first opened
- expiration or ‘use by’ date (if one is not present) particularly with chemicals that are prone to aging and oxidation - either the substance themselves or their containers.
- NB: Setting an expiry date is not an explicit HS Regulations requirement but we advise that checking the substance and container forms part of the risk assessment to ensure teachers use substances that are fit for purpose only.

# SAFETY AND SCIENCE – Inventory

An inventory for hazardous chemicals must include:

- the product or chemical name
- United Nations (UN) number (if available). If there is a UN number, it will be in section 14 of the SDS
- the maximum amount likely to be at the workplace (Note: specific quantities are not needed! But an estimate is good for stocktaking)
- its location
- any specific storage and segregation requirements. (See the following sections of the SDS for this information)
- an SDS or condensed version of the key information from the SDS (paper or electronic versions are acceptable)
- any hazardous waste

# SAFETY AND SCIENCE – Inventory

| Chemical Name | CAS Number | UN Number | Classification | GHS Classification | Max Amount onsite | Units | State | Currently Stored | Area | electronic SDS | Storage requirements | Incompatibilities |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone (Propanone ) | 67-64-1 | 1090 | 3.1B 6.1E(oral) 6.3B 6.4A | Flammable Liquids (Category B) Skin irritation (Category B) Eye irritation (Category A) | 2500 | mL | l | Flammables Cabinet HGS | Class 3 | yes | stored and used in a well ventilated area away from sources of ignition. Electrically link and ground metal containers for transfers of the product to prevent accumulation of static electricity | Strong oxidizing agents, strong acids. |
| Hydrochloric Acid 37% | 7647-01-0 | 1789 | 6.1B (inhalation) 6.1D (oral) 6.1D (dermal) 8.1A 8.2B 8.3A 9.1D | Corrosive to Metals (Category A) Skin corrosion (Category B) Serious eye damage (Category A) | 5 | L | l | Hazardous Good Store | Class 8 | yes | Store in cool place. Keep container tightly closed in a dry and well-ventilated place. | Corrodes metal. |
| Hydrogen Peroxide 35% | 7722-84-1 | 2014 | 5.1.1B, 6.1D (oral) 6.9B (oral) 6.9B (inhalation) 8.2B 8.3A 9.1D | Oxidizing liquids or solids (Category A) Acute toxicity, Oral (Category D) | 1 | L | l | Chem Store | Fridge | yes | Recommended storage temperature 2 - 8 °C | acids , reducing agents |
| Copper (II) Sulfate pentahydrate | 7758-99-8 | 3077 | 6.1D(oral) 6.3A 6.4A 6.5B(contact) 6.9B(oral) 9.1A(fish) | Acute toxicity, Oral (Category C) Skin irritation (Category A) Eye irritation (Category A) Aquatic toxicity (Acute or | 50 | g | s | Chem Store | Class 6 Cupboard | yes | Store in a cool, dry well-ventilated area away from extremes of temperature, ignition sources, acids and reducing agents. Keep | Hygroscopic. |

# SAFETY AND SCIENCE – WHO IS RESPONSIBLE?

**7.4.1 Upkeep of a laboratory/taiwhanga and equipment**

- Conduct regular inspections of safety and first-aid equipment as often as requested by the laboratory manager.
- Notify the laboratory manager, in writing, if a hazardous or possibly hazardous condition (for example, malfunctioning safety equipment or chemical hazard) is identified in the laboratory and follow through on the status.
- Never use defective equipment.

# SAFETY AND SCIENCE – SUBSTANCES

Appendix 4 – Substances prohibited for use in schools/kura

Appendix 5 – Substances with greater hazardous nature than educational utility

Appendix 6 – Substances with a hazardous nature, but with potential educational utility

# LIMIT USE - NOT SO NAUGHTY LIST!

- Appendix 5 has a list of substances that we are allowed to use in a laboratory, but we need to think about how to limit use or dilute to reduce hazard for classroom use.

- Keep in mind that as the technician, you need to assess the risk of using these substances at full strength.  If you have no training or experience with some of these then the risk to your health may be greater. Ensure correct PPE is worn.


How many unlabeled bottles do you have in the Science Department?

Do you carry out Risk Assessments for technician procedures which involve hazardous substances?

What are steps that you can take to improve Health and Safety?

Have you had an audit of Health and Safety in the Science Department?


Ask them now!

Think of them later – then send an email to nzase@xtra.co.nz

Questions will be shared via STANZ and NZASE newsletters


KEEP
CALM
AND
CARRY
ON
KeepCalmAndPosters.com