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AIMS: Australia's tropical marine research agency.

LABORATORY SAFETY INDUCTION MANUAL

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INSTRUCTIONS

Induction begins with the viewing of the Laboratory Induction Film. At the end of the film you are directed to this manual, which you must read and then complete the attached questionnaire.

Upon successful completion of the online induction, your AIMScape profile will be updated to reflect your induction status. As you are asked to complete more tasks at AIMS your supervisor may require you to complete other lab-related inductions and safety training. You are required to complete any specific inductions prior to starting working in the lab. Contact your supervisor and area manager to arrange suitable time.

INTRODUCTION

The sections are arranged so that they begin with a summary statement, this is then explained and a contact is given for further information if appropriate. The induction has a goal of raising awareness of safety as an important part of your work at AIMS and we expect that you have this knowledge before you begin at any of our workplaces.

This Induction Manual will also be available on AIMSCAPE, for your future reference.

DEFINING SAFETY TERMINOLOGY

Safety	implies security and protection, the absence of danger
Hazard	a situation or thing that has the potential to cause harm
Risk	The effect of uncertainty on objectives, characterised by potential events and consequences and the associated likelihood

A Hazard/risk Rating is the product of the severity of the hazard and the likelihood of the risk. By combining the two we may compare hazards and thus prioritise hazards at AIMS

It is vital that once we complete a hazard/risk assessment that we monitor and review the control measures under review their effectiveness may be known and changed as necessary. Your supervisor/lab manager will help with an introduction to hazard assessments at AIMS

HAZARDOUS SUBSTANCES AND DANGEROUS GOODS

Hazardous substances: are those that, following worker exposure, can have an adverse effect on health. Examples of hazardous substances include poisons, substances that cause burns or skin and eye irritation, and substances that may cause cancer. Many hazardous substances are also classified as dangerous goods.

A substance is deemed to be a hazardous substance if it meets the classification criteria specified in the Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004] (Approved Criteria).

Substances that have been classified according to the Approved Criteria are provided in the online database called the Hazardous Chemical Information System (HCIS).

Dangerous Goods: are substances, mixtures or articles that, because of their physical, chemical (physicochemical) or acute toxicity properties, present an immediate hazard to people, property or the environment. Types of substances classified as dangerous goods include explosives, flammable liquids and gases, corrosives, chemically reactive or acutely (highly) toxic substances.

The criteria used to determine whether substances are classified as dangerous goods are contained in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The ADG Code contains a list of substances classified as dangerous goods.

WORK HEALTH AND SAFETY LEGISLATION

Duties of AIMS can be summarised as: Safe Person, Safe Place, Safe Systems of Work, Safe Plant, Safe Access / Egress.

Duties of the Employee may be summed up as: Co-operate with Employer, Report defects in equipment, Do not endanger others, Use Personal Protective Equipment as instructed.

Hazardous Substances are the most prevalent hazard in a Laboratory. Associated duties include:

- Ensure Chemical Risk assessment (CRA), Task Risk assessment (TRA) are prepared, approved, and available to users in the laboratory,
- Provide sufficient labelling of all containers, pictograms are available on Chemwatch;
- Constantly update the Register of Hazardous Substances (Chemwatch) used in your area of responsibility;
- Train all staff in undertaking risk assessments for hazardous substances;
- Instruction and training on the control measures to be adopted;
- Health surveillance (if required) often collectively known as Occupational Hygiene;
- Record keeping of all the above to kept locally and notified to the responsible supervisor or manager.

RISK MANAGEMENT CYCLE

Task / Project Specific Hazard Assessment – Supervisors are responsible for ensuring safety of their workers (Line Management).

Safety relies on Hazard Identification, Risk Assessment, implementing Control Measures and reviewing the effectiveness of the controls to ensure Continuous Improvement.

Incidents often occur because the controls, which were noted in procedures, were not in place thus not implemented. The AIMS approach is that ongoing safety depends on regular assurance that these controls are working as intended.

Before commencing any task you need to review the TRAs, CRAs and SOPs relevant to your task and alter/review (if needed) to suit your specific task, in consultation with your supervisor and the lab manager.

INCIDENT REPORTING

All accidents, incidents or near misses must be reported.

The purpose of the incident reporting is to determine the root causes and develop strategies for avoiding similar incidents or hazards in future. Your supervisor, area manager and HSE must be verbally notified on the day the incident occurs. An incident report must be completed in Riskware available on AIMScape and within 24 hours. For more information, refer to the AIMS-HS-19 Hazard Identification, Incident Reporting and Investigation Procedure.pdf

GENERAL LAB SAFETY RULES

- ❒ Make sure you have completed the online General lab induction and any related specific area induction and other training before you commence any work in the laboratory
- ❒ Entrance to a Lab (often designated by red / orange flooring) is prohibited unless inducted or, for ad hoc visits, by escort under the supervision of an inducted person
- ❒ Prepare/read TRA or SOP for every task you are performing
- ❒ Prepare/read CRA for every hazardous chemical you are using
- ❒ Wear suitable PPE whenever working in a lab. The minimum standards may be at the direction of a Lab Supervisors / Manager or dependant on the minimum requirements particular to an area. PPE must be considered during the risk assessment which includes reference to the relevant, TRA, CRA, and SDS
- ❒ Only fully enclosed footwear shall be worn in a lab (sandals, thongs, crocs etc prohibited)
- ❒ Food, drink and chewing gum are forbidden in laboratories.
- ❒ Smoking is strictly prohibited
- ❒ Wearing headphone is not allowed while working in the Laboratory
- ❒ Long hair should be tied back
- ❒ Do not store or prepare foodstuffs or drinks in lab fridges/freezers
- ❒ Keep your workspace clean and tidy
- ❒ Continuously manage your sample collection and provide proper storage/disposal arrangement
- ❒ Ensure that all hazards are clearly signed
- ❒ Hazardous work should be restricted to core time (0800 -1640hrs) and only with another member of staff being present and aware of the hazards
- ❒ Report all incidents to supervisor, area manager, and HSE
- ❒ Consult with Lab Manager/HSE Coordinator if you have any concerns and/or questions
- ❒ Always use an Experiment in Progress Form if leaving an experiment unattended. Make sure you include your name, contact number, list of hazardous chemical used and any particular hazards or special handling procedures, and any shut down procedures. It's also important to make sure all water and electrical connections are secure and safe.
- ❒ Always ensure that heat sources are turned off after use
- ❒ Do not keep more than one days supply of flammables at the bench
- ❒ Securely store highly toxic materials
- ❒ Do not leave any bottles unlabelled
- ❒ Manage your own chemical waste according to the CRA
- ❒ Do not bring chemicals to the lab without notifying the area manager
- ❒ Provide bunding to your hazardous liquid chemicals
- ❒ Do not run waste materials down the sink
- ❒ Store all materials in accordance with the instructions contained within their SDS
- ❒ Ensure that easy access to SDS and CRA is available at all times
- ❒ Safety carriers must be used to transport large bottles
- ❒ Do not use any piece of equipment for which you have not received training
- ❒ Do not attempt to repair any defect in equipment or machinery yourself
- ❒ Report any defects in machinery or equipment immediately to the lab supervisor. Use a 'Caution Out of Order' tag if appropriate

DISCOVERING AN EMERGENCY IN THE LABORATORY

- Remain calm
- Dial 99 to report the emergency
- Press Fire Alarm, break glass if available/appropriate
- Alert Wardens and other occupants
- Only attempt to deal with the actual emergency if you have received training such as fire extinguisher, use of first aid and it is safe to do so
- Don't hesitate to use the safety shower and eye wash stations to wash up chemical splashes off your/colleague's eyes, face and body.

GLOBALLY HARMONISED SYSTEM (GHS) OF CLASSIFICATION AND LABELLING OF CHEMICALS

The GHS is an internationally agreed system of classification and labelling of chemicals, which was developed under the auspices of the United Nations (UN). The GHS document, which is known as the "purple book", describes the harmonised classification criteria and the hazard communication elements by the type of hazard. It provides decision logics for each hazard, examples of classification of chemicals and mixtures and illustrates how to apply the criteria. The GHS is intended to cover all hazardous chemical substances, dilute solutions and mixtures, address how labels and SDS should be used to convey information about their hazards, and how to protect people from adverse effects.

The GHS document (3rd Revised Edition) can be accessed online at the following website: http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html

GHS Symbols and meaning are shown below:


Acute toxicity via oral, dermal or inhalation


Oxidising substances


Aspiratory or respiratory hazard, carcinogenicity, mutagenicity


Explosives, self-reactive substances, organic peroxides


Hazardous to the environment


Compressed, liquefied or dissolved gas


Flammable, pyrophoric, self-heating substances; water reactive


Corrosive, skin damage, eye damage


May cause immediate health effect – skin, eye, respiratory

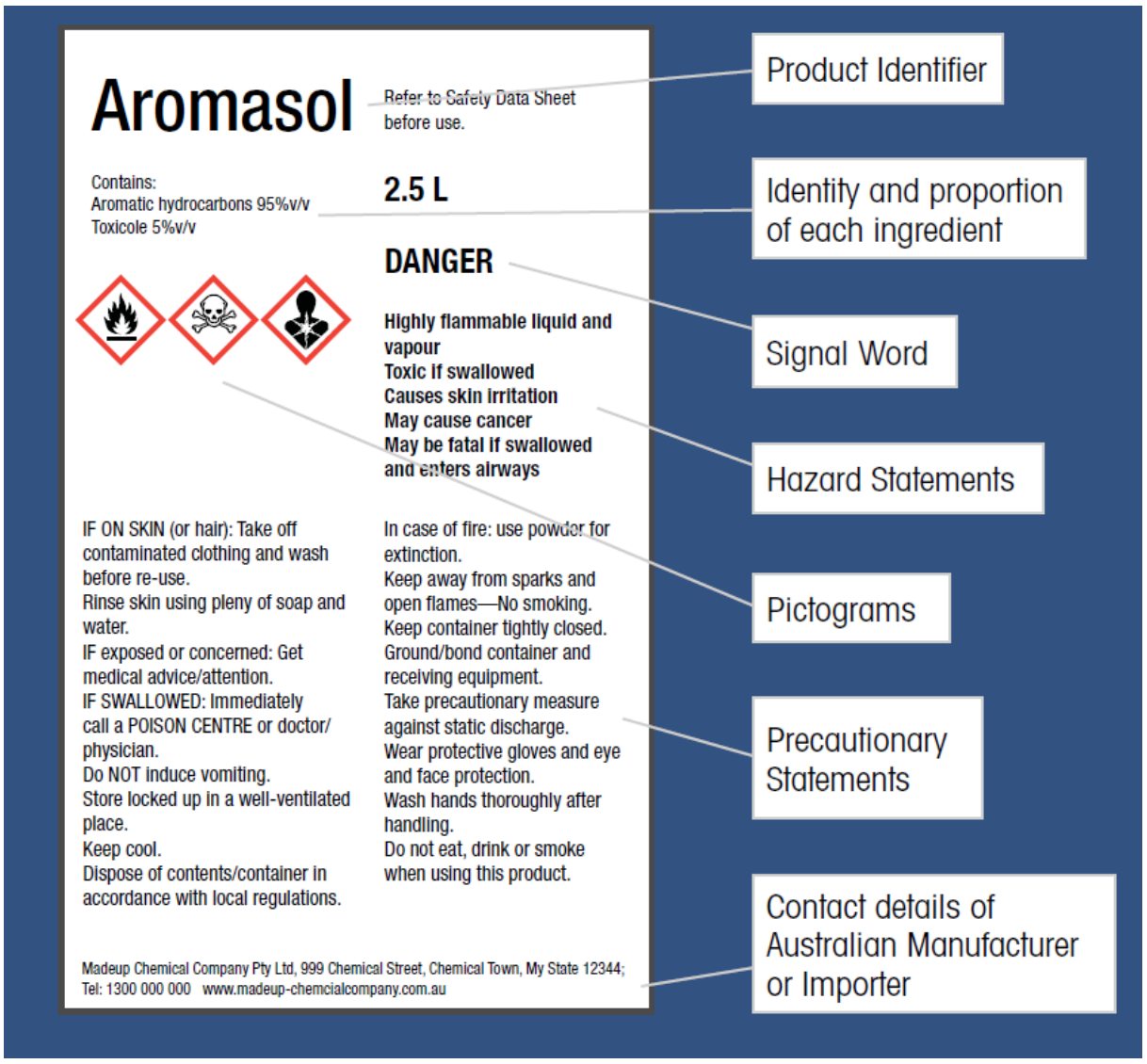
HOUSEKEEPING

A common cause of incidents/accidents are due to slips, trips and falls

Laboratory floor space is to be kept clear at all times and includes storerooms. Access to eyewash stations, safety showers and emergency equipment must be kept clear at all times. .

Hazardous areas must be clearly signed and noting any specific PPE requirements. e.g. Biohazard, Safety Spectacles Area etc.

In accordance with the GHS for labelling hazardous substances, all chemical containers must be clearly labelled indicating contents, person's name, product identifier, hazard statement, pictograms, precautionary statement, and single word as shown in the following example. However, the *minimum requirements for the label of a decanted chemical are the chemical name and the hazard pictogram*.



HEALTH AND SAFETY TRAINING

There are mandatory protocols and procedures in some AIMS labs. Work in these labs cannot commence until the appropriate training has been successfully completed.

The Institute can provide or facilitate training in the following areas:

1. Manual Handling and Manual Task
2. Fire Fighting
3. First Aid
4. Radiation Safety
5. Chemical Handling/Disposal Procedures
6. Operational Risk Management

Note: Risk assessments for projects may identify that training be sought by referencing/reviewing other procedures. Task Risk assessments thus become part of the planning process for how we intend to work

SAFETY DATA SHEETS (SDS)

Safety Data Sheets are our basic reference for handling all hazardous and dangerous substances and, lab users are required to use the SDS to complete a CRA before purchasing new chemicals

When using a hazardous chemical it is the users' obligation to read and understand the CRA or prepare one for any new chemical and be aware of PPE requirement, handling, storage, and disposal processes. Always follow the guidance provided and ask for help (if needed) from your supervisor or lab manager prior to using the chemical.

AIMS provides an on-line SDS database, manifest and labelling system using Chemwatch, a program available on our internal Intranet AIMSCAPE. The SDS provides the following information:

1. Identification of substance / preparation / company
2. Composition / information on ingredients.
3. Hazard identification.
4. First Aid Measures.
5. Fire Fighting Measures.
6. Accidental Release Measures.
7. Handling and Storage.
8. Exposure controls / personal protection.
9. Physical and Chemical Properties.
10. Stability and Reactivity.
11. Toxicology Information.
12. Ecological Information.
13. Disposal Considerations.
14. Transport Information.
15. Regulatory Information.

COMMON TERMS USED IN SDS

Asphyxiant - A substance that can cause unconsciousness or death by suffocation is an extreme hazard when working in enclosed spaces. e.g. Nitrogen gas and Carbon Monoxide gas

Chronic Health Effect - An adverse health effect resulting from long-term, (i.e. months or years) exposure to a substance. An example would be liver cancer from inhaling low levels of benzene over several years. The term is also applied to a persistent (months, years or permanent) adverse health effect resulting from a short-term exposure.

Acute Health Effect - The adverse effects resulting from a single or short term exposure to a substance, e.g. headaches from inhaling solvents.

Explosive Limits - Applies generally to vapours and are defined as the concentration range in which a flammable substance can produce a fire or explosion when an ignition source (such as a spark or open flame) is present. There are upper and lower explosive limits (UEL and LEL). Any concentration between the upper and lower limits can ignite, e.g. methane flammability limits are 5%-15%, Ammonia 15%-28%.

Flash point - This is the lowest temperature at which a liquid can form an ignitable mixture in air near the surface of the liquid. The lower the flash point, the easier it is to ignite the material. For example, petrol has a flash point of -40 ºC.

Flammable liquids – Liquids that produce vapour that can be ignited in air on contact with a suitable ignition source (flash point < 60.5ºC)

Note: - The older term, inflammable is identical in meaning to flammable. To avoid confusion, only use the term flammable. Something that is not flammable is called non-flammable

Boiling Point - The temperature at which a liquid changes to a gas at normal atmospheric pressure

Relative Vapour Density - The relative density of a vapour relative to air. If <1 vapour will rise, if >1 vapour will collect on floors. Important in using gases and solvents.

Refer to the following web site for a full glossary of terms: http://www.ilpi.com/msds/ref/index.html

HAZARD AND PRECAUTIONARY STATEMENTS

The Hazard and Precautionary Statements are those adopted by the GHS to describe health effects and they apply internationally. These Hazard phrases replace the old R phrases. e.g. H200: Unstable explosive. More than one phrase may be combined.

OCCUPATIONAL EXPOSURE LIMITS (OEL)

> ***An occupational exposure limit is the maximum concentration of an airborne contaminant a person may be safely exposed to in a given period.***

These are based on the concentrations at which it is calculated that the majority of the population will have no adverse health reactions. These are detailed in the SDS. Limits are set at 8 hour exposure limits (TWA) and 15 minute exposure limits (STEL). Often high levels of a chemical will paralyse peripheral nerve sensation, thus making it difficult to detect the presence of the contaminant, e.g. NH_3 . If there is potential to be exposed to levels above the TWA (as referred to in the SDS) additional exposure controls must be implemented including the use of fume cabinets and / or respirators.

To reduce exposure to chemicals which give off noxious vapours (e.g. solvents) these should be used inside a fume cabinet.

Reduction of exposure to chemicals can be avoided by:

- ❒ always working in a well-vented fume cabinet with the door sash lowered as far as practicable;
- ❒ avoid the creation of airborne particles outside of a fume hood;
- ❒ ensure that the fume cabinet service tag is dated to within the last 6 months. Otherwise inform the lab manager; and
- ❒ by referring to SDS

The use of hydrofluoric acid and cyanides should be avoided where possible. Their substitution with less toxic reagents should be investigated as a priority and their use is not advised. If such chemicals are used, appropriate emergency response facilities need to be readily available (e.g. calcium gluconate gel for hydrofluoric acid).

Different exposure limits may apply to pregnant or breastfeeding women. Please discuss with your supervisor if there is a need to change your activities.

WORKING ALONE

AIMS defines Working Alone as work carried out in an area where normal means of contact with another individual is not generally available and where the worker is isolated from the assistance of other people because of the location, time or nature of the work being done.

Working alone increases the consequences of certain risk events should they occur and includes tasks that either occur outside of normal working hours or in a remote location, where no one can hear a call for help or can be depended upon to assist you in an emergency.

Unless the work is isolated by location, work during normal business hours is generally not considered working alone.

In order to protect AIMS workers from this increased risk, AIMS has specified certain tasks that should not be performed alone (Restricted Tasks), and others that can once defined controls have been put in place (Non-Restricted Tasks). Refer to HS-10 Working Alone Procedure.

In exceptional circumstances, Restricted Tasks may be risk assessed and approval granted via a dispensation process. For this to occur, a strong case must be put forward for why the work must be performed alone, and a task specific risk assessment completed and approved by both the workers Team Leader and the HSE Coordinator. Refer to HS-10 Working Alone Procedure.

MANUAL HANDLING

Any activity involving the use of muscular force (or effort) to lift, move, push, pull, carry, hold or restrain any object, including a person or a thing. It also includes activities that involve repetitive or forceful movements and or awkward postures which contribute to all types of injuries but especially on the back.
A hazardous manual task can be described as:

Any manual task having any of the following characteristics:

a) i. repetitive or sustained application of force
   ii. repetitive or sustained awkward posture
   iii. repetitive or sustained movement
   iv. application of high force
   v. exposure to sustained vibration

b) a manual task involving the handling of a person or an animal; or

c) a manual task involving the handling of unstable or unbalanced loads or loads which are difficult to grasp or hold.

Examples include, pipetting, microscope work, awkward postures from experimental work, movement/transporting of equipment or supplies (gas cylinders) lifting or moving nally bins of samples/gear.

Participatory Ergonomics for Manual Tasks (PERforM) is a simple manual task risk management program based on participative ergonomics, providing a framework to help employers engage with workers at all levels to identify, assess and control manual tasks risks within their workplace using higher level hierarchy of controls. This training program is a useful course to assist you with analysing your work tasks and identifying the hazardous components.

All workers in the laboratory should complete AIMS short courses of Manual Handling and PERforM to equip themselves with tools and knowledge to undertake manual tasks safety in a lab environment. Good ergonomic set up is also needed, and the HSE team can provide assistance in reviewing your workstation both in the lab and the office.

FOR ADDITIONAL INFORMATION REFER TO THE AIMS HS-17 ERGONOMICS AND MANUAL TASKS PROCEDURE

CHEMICAL PURCHASES

Consider use, amount, storage and disposal before you buy a chemical substance.

Substitute for less hazardous materials if possible.

You must have an approved CRA for each of your new chemicals prior placing the purchase order.

Consider consuming existing chemical stocks as an alternative to purchasing new chemicals. Other work areas may have excess chemicals that could be used instead. Identify such stocks by searching the chemical manifests available in Chemwatch.

CHEMICAL STORAGE AND COMPATIBILITY

Chemicals must always be stored under the conditions recommended by their SDS.

Don't store flammable chemicals in domestic fridges and freezers

Take note of such things as incompatible chemicals, temperature restraints, flammability, toxicity, etc. Highly toxic materials should always be locked away securely.

Materials with a low flash point should always be risk assessed before finding the appropriate store area.

Flammables should always be stored in a flammables cabinet or spark proof refrigerator, with only the minimum amounts removed for use at the bench.

CHEMICAL SPILLS

All chemical spills must be recorded as an incident in Riskware

General laboratory spill kits are available for use at Safety Stations situated around each AIMS facility. These kits are suitable for spills up to 2 ½ litres. Specialist kits (e.g. specific to acids, caustics etc) may also be available. Ask your laboratory supervisor about these kits.

Always follow the instructions as detailed on the general laboratory spill kits and ensure used item are replaced immediately. Please contact the Laboratory manager for replacements.

FLAMMABLE SOLVENTS

Organics must never be used / stored near oxidising compounds e.g. perchloric acid, peroxide. Solvents must never be used in laboratories where naked flames are in use. Flammable solvents should be kept in small quantities with excess returned to a flammable liquids cupboard. On-line vacuum systems must have solvent traps for flammable vapours.

FUME CABINET

When using a fume hood keep the sash as low down as possible.

Chemicals are not to be stored in fume hoods

If a sash is left open the efficiency of the air extraction unit decreases and noxious fumes may escape from the fume cupboard. When working at a fume hood keep the amount of equipment within the hood to a minimum in order to minimise any disruptive effect on the air flow.

Do not use fume hoods as ventilated storage cabinets.

If equipment must be held in the hood while working keep it to the rear of the cabinet to remove it from the extraction air flow.

Do not use a standard fume hood for work involving perchlorates or potentially explosive materials unless it has been designed for these uses. There will be sign on the cabinet to this effect.

Do not use a fume hood for work with microorganisms unless specifically designed for this purpose (i.e. within the PC2 lab).

Minimise the amount of arm movement within the hood.

Upon completion of the work close the sash and leave the fans running for a period of time to ensure that the hood is fully evacuated of any residual chemical. Leave fume cabinets ON if they are ventilating chemical storage cabinets.

Avoid the use of loose, light items (e.g. paper tissues, pieces of cling wrap) in fume cabinets – they may get picked up by the airflow and block the exhaust system.

Avoid the use of a bunsen burner in fume hoods unless properly risk assessed and appropriate controls implemented with approval by the laboratory manager.

If significant amounts of flammables are being used or the release of large amounts of flammable vapour is expected, ensure that the materials within the hood are flame proof and that a fire extinguisher or fire blanket is nearby. Our cabinets also have a ‘Fan Boost’ button that increases airflow for 10 minutes.

Always use an ‘Unattended Experiment Form’ if leaving a hood unattended. Always use a fume cabinet, NOT a pull-down extractor hood, for operations with very hazardous chemicals e.g. acrylamide.

Do not use a fume hood for writing up your work. Workstation space is provided.

CHEMICAL WASTE DISPOSAL

Clean up procedures for chemicals should be known before a spill occurs.

Each laboratory will need to have site specific kits available.

Do not allow waste to build up, dispose of your waste on a regular basis and do not wait until the end of your research!

To reduce waste always order in minimum amounts of chemicals. Cheap bulk purchase prices equal expensive disposal costs, so the initial economy is lost. Clearly label waste containers with the contents, the date of filling, the lab number and your name, using a label maker.

Waste disposal containers must be suitable for the waste liquid being stored in it. Refer to SDS. Use the same waste container for the same types of waste, e.g. keep all mercury contaminated waste separate to other waste, always separate chlorinated solvents from non-chlorinated solvents where possible, water-based from non-water-based, polar solvents from non polar-solvents, methanol from ethanol, hexane, methylene chloride.

Waste solvents are still flammable, store under the same regulations for its pure form.

Certain chemicals can be disposed of within the AIMS facility at Cape Ferguson. Evaporation is conducted in the chemical waste management shed. This procedure applies to only volatile non-chlorinated solvents (e.g. acetone, ethanol). Workers who use this facility must read the procedural risk assessment and complete a procedural checklist before disposing of waste.

If unsure how to dispose a chemical, please refer to the CRA. If still unsure, consult with your supervisor or the lab manager.

PERSONAL PROTECTIVE EQUIPMENT

Wear PPE at all times

Ask for training if you have not used an item of PPE before

Your PPE must be fit for purpose

Wear suitable PPE whenever working in a lab. The minimum standards may be at the direction of a Lab Supervisors / Manager or dependant on the minimum requirements particular to an area. PPE must be considered during the risk assessment which includes reference to the relevant SDS.

Only fully enclosed footwear shall be worn in a lab (sandals, thongs, crocs etc prohibited).

Use of PPE is the responsibility of the individual (duties of employees). A guide to the personal protective equipment required should be available from the SDSs and associated risk assessments.

Laboratory coats and/or other appropriate protection must be worn by all workers whilst working with any hazardous substances in all areas (e.g. laboratories, workshops, vessels) - consult the SDS and risk assessment.

A variety of safety gear such as spectacles and gloves are available from stores and must be worn at any time a biological, chemical or physical hazard exists.

All PPE must be worn in accordance with manufactures specifications and be maintained in good condition.

EYE PROTECTION

Contact lenses are not safety eye protection and cannot be worn in the laboratory

Safety glasses must be worn at all times in the laboratory if identified during the risk assessment process, and must have integral side protection devices (available from stores).

Standard Prescription spectacles are generally inadequate against flying objects or particles and could even be hazardous. For persons requiring eye protection in addition to sight correction, the use of prescription spectacles worn with additional protection, e.g. overglasses, wide vision goggles or specially manufactured glasses will be necessary. For occasional use, overglasses or goggles may be sufficient but for regular usage, prescription glasses specially manufactured to laboratory standards can be justified.

AIMS will fund suitable prescription eye protectors, provided that the costs are not met by the person's own health insurance cover. Funding for prescription eye protectors must be approved by the Team Leader or Institute Laboratory Manager.

When working with exposed UV light sources, appropriate safety glasses must be worn with UV protection lenses.

Check your safety glasses every day, if they are damaged have them replaced. If your Safety glasses don't fit comfortably or fit for the purpose, ask your supervisor for a better pair before commencing the task.

LABORATORY COATS

Lab coats should be laundered on a regular basis and at least monthly.

GLOVES

Gloves must be worn when handling hazardous chemicals including lab chemicals. The selection of the appropriate glove is specified in the SDS. These are available from stores.

Approximately 20% of people are allergic to standard latex gloves. Others will develop sensitivity to the powder on any glove type. If you develop a skin rash or irritations stop using them at once.

The useful websites and links section at the end of this manual contains a link to a database that provides information on the chemical compatibilities, permeation times etc for various brands and types of lab gloves.

EQUIPMENT SAFETY

Do not use any piece of laboratory equipment unless you have received instructions in how to use it and are confident that you are fully aware of all of the potential hazards.

Supervisors/sponsors are responsible for ensuring users have received appropriate training and induction prior to authorising the use of specialist equipment.

Plastic or rubber tubing bringing cooling water to rotary evaporators, solvent stills and other semi-permanent systems should be fastened onto the apparatus and water taps with wire, plastic tags or screw clips. The exit tube must pass the water down a drain that is able to cope with the flow, and be anchored to prevent ejection of water if flow rate or water pressure rises.

Supervisors/sponsors are responsible for making sure their workers know how to use equipment.

Be aware of the hazards posed by the super conducting magnets used in Biomolecular Analysis Facility. Those wearing pacemakers should be especially careful. The hazard is most easily controlled by always seeking permission before entering the area and not bringing any visitors into the area with being supervised by the workers working with the NMR.

ELECTRICAL SAFETY

AIMS has in place strict controls around the performance of 'Electrical Work'

Electrical Work Includes:

- connecting electricity supply wiring to electrical equipment or disconnecting electricity supply wiring from electrical equipment
- installing, removing, adding, testing, replacing, repairing, altering or maintaining electrical equipment or an electrical installation
- replacing electrical equipment or a component of electrical equipment (components that form part of a circuit)
- replacing light bulbs, fluorescent tubes, fuses, etc.

Individuals must be authorised and competent to perform 'Electrical Work' due to the risk of serious injury or death resulting from electrocution, falls and burns**.** An AIMS Electrical Work Exemption Form is available on AIMSCAPE for those individuals or groups seeking dispensation to undertake maintenance tasks considered "electrical work". The form must be completed with the inclusion of a safe work method or Task Risk Assessment (TRA).

Electrical equipment must be inspected prior to use to ensure current test tag and to check for damage to cables or equipment from chemicals or heat etc. If damage or fault is detected, tag the equipment "Out of Service" and notify the area manager.

All electrical installations must be protected by an Electrical Safety Switch; portable electrical equipment must have a Residual Current Detector (RCD) in place.

Prevent overloading power outlets and power boards and ensures power boards / cords are suitably rated for the current draw. Do not tamper with the internal switches or terminals of electrical equipment.

All electrical equipment, plant and electrical leads must be used in a safe manner so they do not impede or endanger the safety of workmates or yourself.

At AIMS Electrical work does **not** include:

- work that involves connecting electrical equipment to an electricity supply by means of a flexible cord plug and socket outlet (e.g. plugging into a power point)
- work on a non-electrical component of electrical equipment if the person carrying out the work is not exposed to an electrical risk e.g. filter replacement on water purifying units, changing photocopier toner cartridges.

GLASSWARE

Check all glassware for cracks before use.

Always check the integrity of glassware - an evacuated glass flask should be coated with adhesive tape in case of implosion and do not heat borosilicate glassware 1L and beyond 450 °C. Examine all glassware carefully for any cracks or damage before use. Only suitable glassware may be placed

under a vacuum. When glassware under vacuum breaks, the implosion may spray glass pieces anywhere. Glassware under high pressure should only be used with total containment.

Cleaning and storage

- Glassware for washing must be rinsed with water before being placed in washing baths
- avoid storing glassware above eye level,
- do not store caustic solutions in glass stoppered containers and
- heavy or awkward items should not be stored above eye level.

Disposal:

- Dispose of chipped, cracked or broken glassware is into waste bins labelled “glass only” (usually blue).
- Glass blowing by lab workers is not permitted. It is to be done only by an authorised qualified trades person.
- Smaller objects can be placed in sharps containers (usually yellow).
- Do not put glass in a general usage bin.

SHARPS

All metal sharps such as syringe needles and blades MUST be disposed of properly into a proper Sharps Container (usually yellow). A variety of these containers of different sizes are available through AIMS stores. If a needle stick injury occurs, wash the injury site with soap and water, immediately contact your supervisor and the applicable Lab supervisor.

LASER SAFETY

Do not use lasers without full training.

- Use the lowest output possible.
- Use totally shielded systems (class 4) where possible.
- Where required, strictly restrict access to areas of use and install appropriate signage in accordance with Australian Standards.
- Wear suitable eye protection.
- Remove all reflective materials from area, e.g. wrist watches.
- Where practicable, ensure that all beams are operated at a height well below eye level.

CENTRIFUGE SAFETY

Never use a centrifuge before you have received instruction in its use.

Keep a log of all ultra-centrifuge use. Before use, examine the rotor and seals for damage or build-up of material. Never over fill centrifuge tubes. Do not exceed maximum rotor speed. Ensure that rotor is correctly balanced. Samples must be positioned correctly and ensure that rotor is properly attached to spindle and will not dislodge during spin (refer to Safe Operating Procedure if in any doubt). Check that tube material is compatible with contents. Never try to open the centrifuge lid when the rotor is still in motion. Only authorised persons may undertake repairs to a centrifuge.

Refer to the Safe Operating Procedure for the centrifuge.

CARCINOGENS

All containers holding carcinogens must be clearly labelled “CARCINOGEN”. Note that the Hazardous Substances Regulations and Codes of Practice apply.

Carcinogens are a special group of Hazardous Substances which have a higher level of regulations and requirements as noted in the National Code of Practice for the Control of Workplace Hazardous Substances, Part 2: Scheduled Carcinogenic Substances, NOHSC:2014 (1995).

You’ll need to check this out with your supervisor and/or Lab Manager before using any known or suspected carcinogen.

CRYOGENIC SAFETY

Liquid Helium, Nitrogen etc can cause severe cold burns and frostbite. Asphyxiation is the greatest danger associated with nitrogen and other inert gases since they do not support life and are capable of reducing oxygen concentration to very low levels through displacement and dilution.

There is also an increased Fire/Combustion risk when liquid Helium (He) or LN2 become saturated with Oxygen.

Always take extreme care when handling these materials and refer to your supervisor for training.

When handling or pouring cryogenic liquids suitable gloves, protective clothing and fully enclosed footwear must be worn.

Ensure that the bung of a cryogenic liquid dewar ALWAYS fits loosely in the neck of the dewar – escape of gas from a dewar must NEVER be blocked as dewars don’t have safety valves.

Never travel in a lift with containers of cryogenic liquids

COMPRESSED GAS SAFETY

Use fittings specifically for the gas being used

- never use grease or oils on gas connections;
- all gas cylinders must be secured upright;
- all gas cylinders are to be turned off at main valve when not in use;
- cylinders of highly flammable or toxic gas are not to be stored in laboratories (unless being used);
- use gas specific regulators and always check for leaks after connecting a regulator to a cylinder;
- check with supplier for the cylinder/regulator compatibility;
- do not use excessive force on joins or threads, hand tighten only;
- open gas valves slowly and always wear safety spectacles;
- long gas lines are to be labelled or coded;
- never store corrosive substances near gas cylinders.
- never use compressed gases without being trained in their handling:
- understand cylinder safety, ask your supervisor or the lab manager;

- always ensure that the regulator in use is suitable for that particular gas and for the contained pressure within the cylinder;
- ensure that the gas tubing is in good condition and is suitable for the gas, e.g. never use natural rubber tubing with oxygen;
- never lay cylinders on their side;
- when using gases that are flammable, remove potential sources of ignition from the lab where possible;
- always transport cylinders in a cylinder trolley equipped with straps for securing cylinder in place and check condition of the trolley before use;
- be aware of the potential manual handling issues when moving cylinders;
- ensure that cylinders are securely fastened, at 2/3 their height, to the bench or wall;
- make sure you are aware of the valve thread direction to avoid damaging regulators, e.g., Oxygen right hand thread and Hydrogen left hand thread;
- never travel in a lift with a cylinder; never use lubricants or teflon/plumber's tape on cylinder valves and regulators.

USE OF RADIOISOTOPES

You must consult with the Radiation Safety Officer (RSO) prior to considering any work involving radioisotopes. Only persons who have completed an accredited radiation safety course are allowed to handle or use radioisotopes. Radiation user accreditation must be renewed every 5 years.

Once appropriate radiation safety training has been undertaken, a risk assessment and standard operating procedures must be completed, then approved by your supervisor and the RSO. Templates for the risk assessment and standard operating procedure can be obtained from the RSO. The risk assessment and standard operating procedure will detail the nature of the experiment, type of radioactive source, storage conditions, safety aspects including personal protection, spill and contamination control and ultimate disposal routes of the radioactive material.

Any work with radioisotopes must be performed in designated areas. Ordering of radioactive material must be approved by the RSO. Any radioactive waste generated must be packaged appropriately. The RSO can provide advice for suitable packaging of radioactive waste.

Storage of radioactive waste must also be approved by the RSO.

FREEZER-ROOM / COLD-ROOM SAFETY

If you need to work in a freezer room (and some cold rooms) for an extended period of time, you need to ensure the risks involved with such work are considered and suitable controls implemented. As a minimum communicate with your supervisor/lab supervisor/colleague or other person before undertaking such work and an approximate duration and remember to dress according to the intended length of exposure to avoid hypothermia. Your extremities will quickly lose feeling in cold environments and so you must have trousers and gloves on when working in these areas.

SHIPBOARD LABORATORY SAFETY

At sea, all laboratory rules are the same as on land. The rolling of a ship increases the risk of inadvertent spills and as such only use small amounts of chemicals and be prepared for spills.

All gas cylinders must be secured (e.g. cylinder clamps and straps).

Chemicals generating toxic or flammable fumes are not be used in shipboard laboratories without the approval of the Vessel Master. Such chemicals shall be specified in the LogReq (refer Field Safety Procedure).

It is the responsibility of the Cruise Leader to inform the Vessel Master of highly toxic or flammable substances on board, before the cruise departure date, and ensure compliance to Department of Transport Regulations.

The Cruise Leader is responsible for administering AIMS laboratory safety policy onboard ship laboratories in cooperation with the Vessel Master.

The Vessel Master should inform the Cruise Leader of impending weather changes which could create a laboratory hazard.

Hazardous chemicals are not to be disposed down laboratory sinks without the approval of the Vessel Master.

REFERENCES

AS 2243 SAFETY IN LABORATORIES

Other useful Australian Standards

AS 2982 LABORATORY CONSTRUCTION

AS 1216 CLASSIFICATION, HAZARD IDENTIFICATION AND INFORMATION SYSTEMS FOR DANGEROUS GOODS

AS 1715 SELECTION, USE AND MAINTENANCE OF RESPIRATORY PROTECTIVE DEVICES

AS 1716 RESPIRATORY PROTECTIVE DEVICES

AS 1940 SAA FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE

AS 2830 GOOD LABORATORY PRACTICES Part 1 Chemical Analysis

AS 2031 SELECTION OF CONTAINERS AND PRESERVATION OF WATER SAMPLES FOR CHEMICAL AND MICROBIOLOGICAL ANALYSIS Part 1 Chemical Part 2 Microbiological

Compressed gases safety

AS 4267-1995	Pressure regulators for use with industrial compressed gas cylinders
AS 4267-1995/Amdt 1-1995	Pressure regulators for use with industrial compressed gas cylinders
AS 4267-1995/Amdt 2-1998	Pressure regulators for use with industrial compressed gas cylinders
AS 4484-1997	Industrial, medical and refrigerant compressed gas cylinder identification
AS 4484-1997/Amdt 1-1997	Industrial, medical and refrigerant compressed gas cylinder identification
AS 4484-1997/Amdt 2-1998	Industrial, medical and refrigerant compressed gas cylinder identification
AS 4603-1999	Flashback arresters -Safety devices for use with fuel gases and oxygen or compressed air
AS 4706-2001	Pressure gauges for regulators used with compressed gas cylinders
AS 4840-2001	Low pressure regulators for use in industrial compressed gas reticulation systems

USEFUL WEBSITES AND LINKS

http://toxnet.nlm.nih.gov/

Hazardous Chemical Information System (HCIS)

http://www.uq.edu.au/hupp/index.html?page=25068&pid=25015##schedule_9

http://www.cdc.gov/niosh/npg/npgsyn-a.html

http://www.aiha.org

http://www.safeworkaustralia.gov.au/NR/rdonlyres/C5FA8374-318E-49AC-A1FB-5E75BEE5868C/0/GuidanceNoteontheInterpretationofExposureStandardsforAtmosphericContaminantsintheOccupa.pdf

https://www.coleparmer.com/safety-glove-chemical-compatibility