Safety instructions for users of the laboratories at The University Centre in Svalbard

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1. Background and Objective

The purpose of this document is to ensure that all persons follow the same rules and procedures in the UNIS laboratories. These routines apply to all employees, students, guest researchers, and visitors using the lab facilities at UNIS. You are obliged to work as per the guidelines given below.

The objectives of this document are to:

- avoid damage/injury to people, property, equipment and the environment
- provide comprehensive guidelines for risk assessment and design of routines at the various laboratories/workshops where people engage in activities involving hazardous chemicals or machinery
- give students and employees an understanding of and insight into HSE as an important part of the work in laboratories and workshops

You are to read this document, sign the access page in the appendix and meet with the lab leader in order to gain access to the UNIS labs. This document should be available for you to refer back to throughout your working period at UNIS.

2. Responsibilities

The lab leader is responsible for HSE in the labs:

- all new methods which produce hazardous waste are evaluated before being conducted
- highly toxic / poisonous / ionizing substances are always scrutinized under the substitution requirement to be able to switch out with less hazardous chemicals
- reduce the burden on the environment by adopting new more environmentally friendly operations
- ensure that appropriate policies and procedures are available for review at any time by all users of the labs

Project managers, supervisors and course lecturers are responsible for the training and supervision of employees, students, and guests in their day-to-day work.

Each user (employee, student or guest researcher) must ensure that they perform their work in accordance with the stipulated guidelines and work routines. Each user has a responsibility to complete the necessary compulsory training, use personal protective equipment, and report accidents, spills, and concerns about the safety in the labs

3. Training

All employees, students and guest researchers working in laboratories must complete the university's compulsory safety training, and must be documented in writing.

This includes:

- Information on general safety and work routines
- Discussion on the elements of risk and potential hazards at the specific laboratory/workshop and/or duties/exercises/experiments by making risk assessments
- Step by step review of relevant duties/exercises/experiments
- Use of personal protective equipment, and its whereabouts
- Location of available first aid equipment
- Measures to be taken and equipment location in the event of chemical spills (if relevant)
- Information on fire safety and evacuation routines
- Routines on notifying duty officer about lab work
- Routines for notification of injuries, accidents and nonconformity

4. General Safety Rules

In a laboratory there are a number of elements of risk and several precautions to take. If the safety instructions along with rules and procedures are not followed, there is a greater possibility for injuries and damage on both persons and equipment.

Risk assessments must be performed for all equipment, exercises/experiments, and/or duties and any necessary safety measures must be implemented before the equipment, exercise/experiment, and/or duty is adopted, these assessments must then be approved by the lab leader. Use of personal protective equipment and safety routines must be adapted for each laboratory/workshop and the specific operations that are being performed.

- Unauthorised persons are not permitted to enter premises where people engage in activities involving hazardous chemicals or machinery.
- Doors to facilities where people engage in activities involving hazardous chemicals or machinery must **always** be locked when no one is present.
- Good order in the laboratories is important for safety. Instruments, chemicals, apparatus, and books which are not being used must be put away. Each individual employee and student is responsible for tidying/cleaning the workbench in the laboratory after use. Wipe up mess as soon as possible, you are the only one who knows what has been spilled. Any ongoing experiments, or those put on hold, are to be labeled with: name, contact, date, and contents of containers.
- The consumption and storage of food or drink is not permitted in facilities where people engage in activities involving hazardous chemicals or machinery. This is the case for all labs and workshops.
- Private experiments or work is not permitted.
- Accidents and hazardous situations **must** be reported immediately to the supervisor, safety representative, and/or lab personnel.

- If it is necessary to perform work involving hazardous chemicals or machinery outside normal working hours, this must be agreed upon with the lab leader beforehand, and the routines for notifying the duty officer must be followed.

Instruction manuals are kept in the room with the corresponding instrument, a copy can be found in the office of the lab leader.

Safety rules – work involving hazardous chemicals

The term hazardous chemical refers to chemicals that are classified and labelled as hazardous in relation to health, safety and environment.

- Read the material safety data sheet (MSDS) and acquire information about the chemicals to be used, the risks associated with their use, necessary personal protective equipment, and first aid. The MSDS may be found in the chemical database 'Eco online'. Note: be aware of the hazard symbol on the label.
- Any required personal protective equipment must be available and be used.
- Any unfamiliar chemical should be considered toxic.
- Wash your hands thoroughly after working with chemicals or infected material. Use soap or other cleansing agent.
- When using highly flammable chemicals, remember emergency preparedness and locate the nearest correct fire extinguisher.
- All bottles, flasks, glass containers etc. used to store chemicals must be labelled with content, date, name, and any warning. The user is responsible for throwing away/destroying all solutions that are no longer being used, even after project and lab work are finished.
- Unlabeled bottles, flasks, glass containers etc. containing unknown chemicals should be disposed of as toxic hazardous waste. See our guidelines on Waste Management.
- Flammable chemicals must be stored in fireproof cabinets. Such cabinets must be labelled.
- Toxic chemicals must be stored in suitably ventilated cabinets. Such cabinets must be labelled.
- Take note of where the nearest fire extinguisher, emergency shower, eyewash station, and first aid kit are located and how to use them before beginning work.

Safety rules – work involving hazardous machinery

- Any laboratory/workshop containing hazardous machinery or equipment must have a sign on the entrance door stating this.
- Following a risk assessment, any especially dangerous machinery/equipment must have an appropriate sign or labelling.
- Use appropriate work clothes and personal protective equipment (see specific risk assessments)

Refer also to specific risk assessments and safety routines/instruction that have been made for some of the laboratories, workshops, chemicals, and machinery.

See also these guidelines that apply at the University Centre in Svalbard

- Guidelines/ Safety Instructions for individual labs
- Risk assessments for hazardous machinery and chemical health hazards
- Standard Operating Procedures
- Routines for exposure registry
- Deviation report protocol

5. Other Safety Rules

Gas cylinders

Gas cylinders are located in a separate room off the back of UNIS and a gas plumbing system is fitted through the building to individual labs. This system is serviced and checked yearly. Some labs have a gas cylinder located in the lab.

- Gas cylinders should only be handled by the few people at UNIS who are trained to do so. Do not attempt to handle these cylinders.
- Gas cylinders must be fastened to the wall so they cannot fall.
- A warning sign for “compressed gas” must be on the door of the room where the gas cylinder(s) is kept.
- If the gas cylinder(s) is removed, the warning sign should also be removed (important in the event of fire).
- As few cylinders as possible must be stored in the laboratory.

You must be familiar with the property of the gas, have the correct reduction valve and know how it is used. Close the valve and the regulator after usage. The reduction valve has a content manometer, which tells the pressure in the cylinder, and an outlet manometer where the amount of gas escaping through the outlet is regulated by an adjustment screw.

Liquid Nitrogen
May cause serious damage if skin is directly exposed.
First Aid: slow heating with water.
Liquid nitrogen must only be kept and transported in specially designed thermo cylinders. Cold resistant “kryo” gloves must be used.

Chemical database
The electronic chemical database is a collection of material safety data sheets (MSDS) and other information about hazardous chemicals, radioactive materials and all hazardous biological materials in existence at the labs and workshops at UNIS. In addition to registration in the electronic chemical database index (Eco online), all labs and workshops should have a folder containing a printed version of the MSDS for the substances used in this location.
If an employee discovers that the chemical database is not updated or they purchase/obtain new chemicals that are hazardous to one’s health and the environment, he/she shall notify the lab leader. The lab leader is responsible for updating the electronic chemical database
Chemicals that are no longer in use should be disposed of and deleted from the chemical database. When a chemical is no longer available at UNIS, please inform the lab leader to delete it from the chemical database.
Link to UNIS’ Eco online: http://app.ecoonline.no/ecosuite/applic/sk/index.php?applicationID=4#13697

Material Safety Data Sheets
A material safety data sheet (MSDS) is a document that contains information on the potential hazards (health, fire, reactivity and environmental) of a chemicals product and how to work safely with it. The MSDS contains much more information about the material than the label. MSDS are prepared by the supplier or manufacturer of the material, and is intended to tell what the hazards of the product are, how to use the product safely, what to expect if the recommendations are not followed, how to recognize symptoms of overexposure, and what to do if such incidents occur.

It is very important that you read these before you begin working with any chemical. It is a necessary starting point for the development of a health and safety program for your lab work. Make sure to read what protective equipment you should be using when handling the substance, and how to clean up any spills. You should know how to clean up a spill before it happens.

Chemicals
The users must be aware of the dangers connected to each chemical they are to work with and follow the safety rules of the laboratories. All work with chemicals should be done under a fume hood when possible. Poisonous or other harmful chemicals must not be used if other less harmful substances can replace them – they should be evaluated using the substitution requirement procedure prior to the commencement of work.

Purchase and disposal of chemicals
Chemicals should always be purchased/ordered by the lab personnel; either the lab leader or department staff engineers, who are obliged to inform the chemical database contact about the purchase of any new chemicals.
Chemicals should always be purchased in the smallest amounts possible. Prior to purchase, it is necessary to assess options for the disposal and management of any chemical residues.
Chemicals that lack MSDS, or if the safety information is insufficient, should be disposed of. For new chemicals where safety information does not exist, it is necessary to prepare safety information that considers any potential hazards.
An annual review of your chemical inventory in the chemical storerooms should be conducted during which disposal procedures should be assessed.

Handling of strong acids and bases:
Never pour water into an acid, ONLY ACID IN TO WATER. Watch out for splashes when opening an acid bottle. Always use protective glasses and a facial guard. Be aware of the heat created by the preparation of strong bases. Never pour strong acids or bases into a drain.

Handling of poisonous substances:
Poisonous substances must be handled with the utmost caution. Make sure that all apparatus and other equipment that have been in contact with the poisonous substance are cleaned immediately.

Handling of inflammable and explosive chemicals:
Vapours from organic solvents are both flammable and poisonous. Avoid using extremely dangerous solvents by substituting them with less dangerous if possible.
When working with inflammable substances do not have open flames in the area, and do not use equipment that cause sparks. Use a well-ventilated area.
Never distill inflammable fluids over open flames. Use a water bath, a steam bath, a hot plate or a heater specially designed for this purpose.

Handling of substances that may cause cancer:
Always stay in a well-ventilated area when working with these substances. Outlet cabinet and benches must be covered with a plastic coated filter paper that must be thrown away after usage. This kind of work must be performed away from all other activities. Use protective gloves and a lab coat. If skin gets exposed to these kinds of substances, rinse the skin well under running water and wash thoroughly with soap. Carcinogens must be stored in locked cabinets.

Handling of radioactive substances
Contact Lab Leader before start working with radioactive substances

6. Safety and Personal Protective Equipment

The employee responsible for HSE in the labs, the lab leader, is responsible for making sure the necessary safety equipment is available

The individual user (employee, student or guest researcher) is responsible for following relevant policies and procedures, and using available protective equipment.

The use of personal protective equipment will vary depending on the laboratory/workshop and the work performed.

Clothing for work in laboratories or workshops

Clothing used in laboratories/workshops should prevent soiling/destruction of privately owned clothing, protect the user against hazardous chemicals, and be of a type that cannot be caught in machinery with moving parts or come into contact with chemicals.

- An appropriate white laboratory coat must be worn for all work in laboratories involving hazardous chemicals. To prevent the spread of chemical spill, the user should remove the laboratory coat when they leave the laboratory.
- When working with hazardous chemicals, the outermost layer of clothing must be quick and easy to take off.
- Appropriate work clothes or a coat must be worn for all workshop activities involving hazardous machinery.
- Garments without loose parts or strings that may be caught in moving parts or soiled by chemicals must be worn for all work involving hazardous chemicals or equipment.
- Long hair must be tied back.

Safety glasses

- Safety glasses/face shield must be worn for all work involving hazardous chemicals.
- Do not use contact lenses. Use glasses (if necessary). The reason for this is that eye fluids can transport chemical vapours behind the lenses and harm the eye. Safety glasses to fit over prescription glasses are available.
- Safety glasses must be worn for all work involving machinery/tools where there is risk of splashing of particles, vapour or liquid.

Gloves

Gloves must be worn to protect the user, others and the subject of the work. Examples of the types of work where the use of gloves may be particularly important include:

- work involving hazardous chemicals and substances
- work involving biological factors
- work involving thermal risks – heat/cold
- work involving cutting tools
- work involving the handling of materials with sharp edges
- work involving radiation sources

Gloves are available in different types, which are suitable for different hazards. To ensure use of the correct type of gloves, refer to the risk assessment, notices in the laboratory/workshop or the material safety data sheet.

Pay particular attention to the gloves' expiry date and any wear and tear.

Gloves should be taken off when leaving the laboratory/workshop.

Footwear in laboratories and workshops

The correct footwear ensures quick and safe evacuation and protection from various types of spillage and/or sharp/heavy objects.

As minimum requirement, the sole and top part of the footwear must be covered, and the shoes must fit well. Depending on the task being performed and the laboratory/workshop in question, a requirement for wearing

footwear that protects against various types of spills, and/or protective footwear (steel-capped/puncture resistant) should be considered.
In the event of the risk of spillage of liquids and chemicals on the floor, the use of shoe covers/boots should be considered.
Shoes should be worn while working in the laboratories. Sock feet and slippers are not enough protection.

Protective glasses, facial guards, gloves, coats and dust masks are found in the laboratories, and extras are found in the laboratory storage room.

Fume hoods
The fume hood should eliminate the risk of inhaling harmful and irritating fumes and dust, as well as prevent the formation of explosive gas mixtures. Fume hoods are *not a storage area* for chemicals.
Proper use of fume hoods:

- When you work in a fume hood, ensure the hatch is as low as possible (not over 30 cm).
- When the fume hood is not in use, pull the hatch completely down (there is still adequate extraction of any chemicals that are in the cupboard).
- Fume hoods used for ventilation/evaporation of hazardous chemicals must be clearly marked with warning signs during this time of ventilation/evaporation
- Be conscious of the correct method – do not disturb the air flow in the hood (e.g. gentle movements, no lateral movement and as few objects in the hood as possible) to ensure proper ventilation.

Face respiratory masks
Face masks should be used in the event of risk of hazardous particles (dust, fog, smoke, bacteria, and viruses) or vapour/gas. Masks are available in various categories:

1. *Air purifying half masks*: Covers the mouth and nose, supplied for particles and gases, and may be used repeatedly until the filter is saturated.
2. *Half masks with replaceable filter:* Covers mouth and nose, supplied for particles, gas or combined filter, may be used repeatedly until the filter is saturated, then replace the filters.
3. *Full face masks with interchangeable filters*: Covers mouth, nose and eyes, supplied for dust, gas or combination filter, may be used repeatedly until the filter is saturated.

Use the correct type of mask, and the correct filters for the contaminants you are working with. See the risk assessment, signs, material safety data sheets, and user manual for the machine/tool. Ensure that the mask is well maintained (check for cracks, and loose connections) and is stored in such a way that it does not become contaminated. Ensure that the mask is connected in such a way that it does not draw in unfiltered air, and is fitted properly to your face to ensure no leaks.

Hearing protection
Following risk assessment, acoustic earmuffs or earplugs must be used for all work that produces loud noises. Ear protection can be found in the laboratory storage room, or by contacting the lab leader.

Emergency equipment
Locate this equipment nearest your work station before beginning your work.

- Emergency shower- These are located in labs where people regularly engage in work involving hazardous chemicals, they are also located in some lab hallways. Locate the nearest emergency shower to your work station before beginning.
- Eye washing stations- Bottles of eye wash solution and/or a fountain for rinsing eyes are available in all laboratories and workshops where people engage in activities involving hazardous chemicals or machinery, or in the hallways outside of these work places. Locate these before beginning work.

- First aid equipment- Suitable first aid equipment is available in, or in the hallways of all laboratories and workshops where people engage in activities involving hazardous chemicals or machinery. The equipment is checked and replenished as required by the lab leader.
- Fire extinguishers- Fire extinguishers are located at all laboratories and workshops where people engage in activities involving hazardous chemicals or machinery. They are labelled as which type of fire extinguisher they are, and are checked regularly by the building maintenance technicians.

Emergency stop buttons
An emergency alarm can be triggered by a button in each of the cold labs upstairs which sounds an alarm in the laboratory hallway signalling for help.

7. Laboratory Equipment
It is very important for your safety as well as the well maintaining of our instruments that you receive instruction or training on instruments before using any of the following. If you need certain information from the manual please make a copy. If you are unable to find the manuals please ask. There are copies in the Lab leaders' office.

Vacuum/pressure:
If one is working with vacuum or pressure in an apparatus made of glass, one must protect oneself with a facial guard. The risk of exicators and vacuum equipment made of glass will breaking is quite high; use extra caution.

Autoclave
Loosen caps on bottles and make sure it is more than 1/3 amount of free air over the fluid in the container before commencing the work. Do not use containers with cracks. Use protective glasses and gloves. If possible, let large quantities of fluid cool before usage.

Centrifuge:
The rotor must be balanced; put equal amounts of tubes on opposing sides of the rotor. Tubes may be damaged in the process and cause splinters. Do not use your fingers to restrain the rotor, wait for it to stop.

Ultrasonic bath:
When using the ultrasonic bath for cleaning purposes hearing protection must be used while working in the same room, and the door must always be kept closed. Ultrasound damages the hearing. Use distilled water to fill the ultrasonic bath as this will keep it clean, and always make sure to fill it; do not fill it only halfway, this will damage the bath. Nothing should ever be placed directly on the bath bottom, this will damage the instrument, be sure to sue the racks.
It is best to place the US bath in a room where no one is working. If you are leaving a running ultrasonic bath in an unattended room, it is important to leave a note on the door stating ear protection should be used while working in this room, not everyone who uses the laboratories is familiar with the risks associated with its use.
If using solvent for cleaning with the US bath, make sure to place the bath in a fume hood.

Freezer/cold-storage:
Carbon dioxide snow (dry ice) or shipments stuffed with carbon dioxide snow must not be kept in cold-storage chambers or in small rooms without ventilation. The carbon dioxide that is formed may suffocate people staying in the room.

Food must not be stored together with laboratory matter in either freezers/cold-storage rooms or refrigerators. Tests/materials that are stored in freezer/cooler must be labeled with name, contents, date to be stored until, as well as a UNIS contact if you yourself are not permanently at UNIS. Each individual user is

responsible for throwing away tests/materials that no longer are being used. Before leaving UNIS always go through the fridge and freezer so to not leave anything behind that you may need, or for others to clean up.

8. Emergency assistance

Routines for reliable and rapid emergency assistance are established at all laboratories and workshops where people engage in activities involving hazardous chemicals and machinery, and where people work alone or outside normal hours of work.

- UNIS Duty Telephone – 95 28 35 11
- Fire Department – 110
- Ambulance – 113
- Police – 112
- Longyearbyen Hospital – 79 02 42 00

Medical aid

Ambulance/medical aid – 113
Longyearbyen Hospital – 79 02 42 00

Please state the following:
1. Your name
2. Where you are calling from
3. The number of injured or ill
4. The nature of the injuries or illnesses
5. If the injury is caused by a chemical, please state what kind of chemical and find detailed information concerning the chemical.

Bring the material safety data sheets (MSDS) for the chemical in question with you to the hospital. The lab leader has detailed information concerning all chemicals.

Remember: first aid for burns is cooling the exposed skin with cold water.

Fire

Fire Department – 110

If a small fire starts:
- Try to extinguish the fire, but do not take any chances.
- If the extinguishing effort fails, close all connecting doors.
- Trigger the fire alarm and call the Fire Department.

When the fire alarm is sounding:
- Switch off all apparatus, end all experiments and turn off the gas flame.
- Shut all doors, windows and switch off the outlet.
- Check the room next door for people or hazards
- Evacuate the building through the nearest exit.

There are smoke detectors in all the laboratories and in the connecting corridors. There are fire extinguishers in all of the labs, as well as in easily accessible places in the corridors. Directions for use are labeled on each extinguisher.

Carbonic acid extinguisher, CO2- extinguisher:

- Used to extinguish fire with inflammable fluids, electrical cords/apparatus
- Not to be used on alkali metals

The carbonic acid extinguisher must never be used on humans or animals. The use of these extinguishers can be poisonous, it is therefore necessary to evacuate the room after it has been expelled. Carbonic acid is heavier than oxygen, and will hence be found down by the floor.

Powder extinguisher:

- Used in offices, cafeteria etc. It is completely harmless for humans.

Fire hose and fire blanket are also found in the teaching-lab, chemistry lab, and cold labs.

9. Chemical spills

Responses in the event of chemical spills

- With few exceptions, and without putting yourself or others in danger, **all** chemical spillage is to be removed – refer to MSDS
- **Never** start to remove the spillage if you are unfamiliar with the risks associated with the chemical or if you are unsure about how to remove the spillage – refer to MSDS
- Find the correct protective equipment before you begin, open windows and then clean the spill.

A spill must be neutralized:

- Acids: can be neutralized using sodium hydrogen carbonate.
- Bases: can be neutralized using a 0.1 N hydrochloric acid solution.

An absorbent with high absorption capacity (chemisorb) must be spread on the floor covering the spill. After the spill has been absorbed, it should be removed with a shovel and then the floor must be cleaned with water. The now contaminated absorbent must be packaged and labeled properly and put in the central waste depot to be disposed of. A gas mask equipped with the right filter and other additional protective gear may need to be used, do not take any unnecessary risks. If it was a large spill, inform the lab leader.

Secure – alert – rescue - evacuate

If necessary, the building may be evacuated by activating the fire alarm, this initiates the emergency preparedness plan.

Toxic/harmful gasses

- Turn off burners and shut off the gas valve
- Evacuate
- Close doors, open windows

Protective equipment

There is an emergency spill response kit located in the Teaching lab and in the lab hallway of the old building.

10. First Aid

BASIC FIRST AID IN THE EVENT OF CHEMICAL ACCIDENTS

Save the health and lives of others without putting yourself in danger

Before working with chemicals – see the material safety sheet for correct treatment and measures in case of spillage and/or injuries. Implement preventive actions, such as, the use of persona protective equipment and limiting exposure.

If an accident does occur, alert locally authorities and call if required:

- Ambulance **113**

For use in further treatment, bring all information concerning the substance in question with you to the medical practitioner, including the MSDS.

Inhaling of poisonous gas, vapour or smoke

- See MSDS for correct treatment
- Remove from affected room
- Fresh air + rest, recovery position

Ingestion of chemicals

- See MSDS for correct treatment
- Rinse mouth with water
- Most often, dilute by drinking lots of water
- Do not induce vomiting unless instructed to by a medical practitioner or the MSDS
- Contact doctor/Poison Control Centre

Chemical spills/splash in eyes

- See MSDS for correct treatment
- Rinse immediately with plenty of water with the eyelid held wide open – 5-15 minutes
- Use eye wash.
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Chemical spills on skin

- See MSDS for correct treatment
- Rinse with water, wash with soap and water
- Remove contaminated jewellery, clothes and shoes
- If larger spill, use emergency shower
- Use correct specific neutralizing and washing solutions for spilled substance. These **must** be located before working with the chemical

Burns

- Rinse with cold water for some minutes, then keep the injury immersed in 15-20°C water for a long period
- If cooling with water is not possible, use burn gel from the first aid cabinet

Electric shock

- Turn off the electricity (switch/socket/fuse), remove the injured person from the electricity source
- NB! be careful for water - conducts electricity
- If necessary: start cardiopulmonary resuscitation (CPR)
- Scalding injuries are treated as burns. Note - there may be major injuries in the dermis/muscular tissue even though the surface looks fine. Check for entrance and exit wounds

- Contact ambulance/medical assistance

In the event of a chemical spill, refer also to the material safety data sheet.

11. Waste Management

A detailed description of the responsibilities, guidelines and regulations concerning UNIS' waste management can be found at: http://www.unis.no/wp-content/uploads/2016/02/Waste_management_UNIS_2016.docx

12. Appendices

Appendix 1 – Approval of training at laboratory/workshop

It is hereby confirmed that the employees, guest researchers or students named below have completed training in relation to the following laboratory/workshop and duties/exercises:

As a minimum, the training has covered the following points:

- Information on general safety and work routines
- Discussion on the elements of risk and potential hazards at the specific laboratory/workshop and/or duties/exercises/experiments by making risk assessments
- Step by step review of relevant duties/exercises/experiments
- Use of personal protective equipment, and its whereabouts
- Location of available first aid equipment
- Measures to be taken and equipment location in the event of chemical spills (if relevant)
- Information on fire safety and evacuation routines
- Routines on notifying duty officer about lab work
- Routines for notification of injuries, accidents and nonconformity